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SOME AUSTRALIAN FISHES OF THE FAMILY GOBIIDÆ.

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(Plates xxxi.-xxxvii.)

It was the original intention of the authors to revise all the Australian species of the Family Gobiidæ, but circumstances have prevented us from carrying out our design. We therefore submit descriptions and figures of such species as we have been able to deal with, and give references to the others. We have been unable to allocate some of the species dealt with to any genera known to us, but as we lack several important papers on the classification of the Gobiidæ, we have preferred to leave them under the broader headings *Gobius* and *Eleotris* rather than create unnecessary additions to the already long list of Gobioid genera.

We have had the advantage of examining the very large collections contained in the Australian Museum, the Queensland Museum, the Macleay Museum, and the South Australian Museum. These include numerous types and cotypes, and many authentically labelled specimens, while the Australian Museum is fortunate in possessing a representative series of Indian fishes from the collection of the late Dr. Francis Day. All these have enabled us to clear up many points in the synonymy of the species dealt with.

We are greatly indebted to the Trustees of the Macleay Museum for the loan of all the Gobies and Eleotrids under their charge. We also have to thank Mr. Edgar R. Waite, Director of the South Australian Museum, for the loan of those in his collection.

Key to the Subfamilies of the Gobiidæ.

- a. Pectoral base very muscular and mobile; eyes erectile..... *Periophthalminae*.
- aa. Pectoral base not unusually muscular or mobile; eyes not erectile.
  - b. Ventral fins more or less united, usually with an anterior membrane connecting the spines<sup>1</sup>..... *Gobiinae*.
  - bb. Ventral fins separate, with no anterior membrane between the spines..... *Eleotrinae*.

Family GOBIIDÆ.

Subfamily PERIOPHTHALMINAE.

*Periophthalminae*, Regan, Ann. Mag. Nat. Hist. (8), viii., 1911, p. 733.

Eyes close together, prominent, erectile; base of pectoral fin very muscular. Pectoral radials elongate, inserted on a broad, laminar ridge of the cleithrum; hypocoracoid and cleithrum enclosing a large foramen, Vertebrae 25-26 (10-11+14-16).

<sup>1</sup> This membrane is present in some species of *Zonogobius* (*Z. nuchifasciatus*), but is wanting in others (*Z. semidoliatus*).

## Key to Australian genera.

- a. Soft dorsal with about 12 rays. Teeth vertical in both jaws, conical, and sub-equal.
- b. Teeth uniserial in both jaws; scales small.....*Periophthalmus*.
- bb. Teeth biserial in the premaxillaries; scales larger.....*Periophthalmodon*.
- aa. Soft dorsal with about 25 rays. Mandibular teeth more or less horizontal; those of the premaxillaries unequal, some subulate.
- c. Body scales small but distinct; mandibular teeth arranged in a row which does not curve inwards posteriorly.....*Boleophthalmus*.
- cc. Body scales rudimentary; mandibular teeth in a row which curves inward posteriorly.....*Scartelaos*.

PERIOPHTHALMUS, *Bloch & Schneider*.

*Periophthalmus*, Bloch & Schneider, Syst. Ichth., 1801, p. 63 (*P. papilio*, Bloch & Schneider).

*Euchoristopus*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 271 (*Gobius koelreuteri*, Pallas).

Form moderately elongate, subcylindrical anteriorly, compressed posteriorly. Body covered with small, cycloid scales, which extend onto the head. Mouth rather small, horizontal, the upper jaw overhanging the lower; lips with fleshy lobes and swellings. Eyes erectile, contiguous, on the upper profile of the head; lower eyelid well developed. Anterior nostrils opening in lobules above the upper lip; posterior nostrils simple openings before the eye. Teeth in a single row in each jaw, vertical, conical, and pointed. Tongue thick, adnate to the floor of the mouth. Gill-openings lateral, separated by a broad isthmus. Two dorsal fins, the first with spines varying in number up to fifteen; second dorsal short, with about twelve rays. Anal opposite and similar to the second dorsal. Pectoral with a scaly muscular base. Ventrals more or less united or wholly separate, with one spine and five rays.

Small fishes of the estuaries and mud-flats of the tropical Indian and Pacific Oceans, one species ranging northward to Japan.

PERIOPHTHALMUS KOELREUTERI (*Pallas*), *Günther*.

var. *ARGENTILINEATUS*, *Cuvier & Valenciennes*.

(Plate xxxi., fig. 1.)

*Periophthalmus koelreuteri* (*Pallas*), *Günther*, Brit. Mus. Cat. Fish., iii., 1861, p. 97.

*Periophthalmus argentilineatus*, *Cuvier & Valenciennes*, Hist. Nat. Poiss., xii., 1837, p. 191.

D. xii-xvi/12-13; A. 12; P. 13; V. i/5; C. 15. Depth 5·7 in the length to the hypural joint; head 4·2 in the same. Eye 4 in the head. First dorsal spine 1·1, median dorsal rays 2·1, median anal rays 2·7 in the head.

Head largely naked, the upper posterior portion of the cheeks and opercles covered with imperfect scales. Eye elevated, contiguous with its fellow on the upper profile of the head; lower eyelid distinct. Snout broad and rounded, with two fleshy protuberances over the mouth, at the tips of which are the anterior nostrils; posterior nostrils situated a little in advance of the eye. Upper lip thick and fleshy, expanded into a broad lobe posteriorly, lower lip with a thick swelling posteriorly; angle of the mouth falling below the middle of the eye. Teeth in each jaw in a single row, short and conical, a few slightly enlarged; palate toothless. Tongue adnate to the floor of the mouth. Gill-opening lateral, not so wide as the isthmus.

Body covered with small cycloid scales which extend forward to behind the eyes, and cover the base of the pectoral and portion of the breast. There are about seventy rows between the base of the pectoral and the hypural joint, and about twenty-four between the anterior dorsal and anal rays. Genital papilla well developed.

First dorsal commencing behind the base of the pectorals; the first spine is usually highest, and the succeeding ones decrease rapidly in length so that the fin is emarginate anteriorly, but may be obliquely truncate; it is separated from the second dorsal by a short interspace. Second dorsal slightly rounded, the middle rays a little longer than the others. Anal opposite the second dorsal but a little more rounded and lower than that fin. Pectoral a little pointed, the median rays longest and reaching the vertical of the vent. Ventrals inserted well before the pectorals, with short, thick rays, and united by a membrane which is so deeply incised that they are almost separate. Caudal broadly rounded, with its lower rays thickened, pennulate and short.

*Colour-marking.*—Greyish brown, with dark bars descending obliquely forward onto the sides; the lower portions of the sides with lighter spots and bars, the head dotted with white. Basal half of the dorsal fins grey, closely speckled with white; a broad, black, white-edged, submarginal band is present on each fin, the broader outer edge forming their white margins. Caudal with irregular bars of dark spots on the rays. Pectoral spotted like the caudal. Ventrals and anal white, with dusky markings.

The above description is based on seven examples, 50-90 mm. long; the proportions are those of the largest specimen, which is figured. They were taken together at King Sound, North Western Australia, and are similar in all structural details and colour-marking, varying only in the relative lengths of their anterior dorsal spines.

*Variation.*—A series of thirty-two specimens 28-94 mm. long, collected together within a space of a few yards at Cooktown, exhibits remarkable variation in the form and construction of the first dorsal fin. The spines vary from 8-15, the number being usually, though not always greater in the larger examples. The posterior spines are sometimes present in young examples, though very minute and difficult to detect; in others they are wholly wanting, and the fin ends abruptly at the eighth or ninth spine. The distance between the two dorsal fins is greater or smaller according to the number of spines developed posteriorly. The margin of the fin is rounded in younger specimens, but in adults the anterior spines are

somewhat produced, so that the margin becomes excavate as in the specimen figured. The following table illustrates the variation of seven examples selected from the above series.

Length.	Number of spines.	Shape of fin.
28 mm.	9	rounded.
29 "	15	"
34 "	8	"
37 "	10	"
57 "	13	emarginate.
71 "	15	"
94 "	13	"

*Habits.*—The habits of *P. koelreuteri* have been observed by one of us (McCulloch) at several localities in Queensland. They move freely about on the mud, when the tide is out, in search of small crustaceans and insects, upon which they feed. When alarmed they skip rapidly away by means of their powerful pectoral, ventral and caudal fins, and retreat into a crab-burrow or some other crevice. At Cooktown, they were abundant around a narrow stream, a few yards in width, which enters Finche Bay; although many were driven towards the water, it was observed that none entered it, but skipped over its surface in a series of short quick leaps to the other side.

At Port Curtis, it was noted that the rapid jumping movements usually seen when they are on land are only adopted as a means of escape. When undisturbed, they move in stages of two or three inches by raising the fore-part of the body on the pectorals, levering themselves forward; at the same time the ventrals are moved forward so that they act alternately with the pectorals, each fin of either pair moving in unison with its fellow. After each interval of walking, the fish looks around for prey by means of its elevated eyes, which are occasionally turned down into their sockets, apparently to moisten them. The agility of these little fishes on the mud is so great that it is difficult to secure specimens without injuring them, and series could only be secured for study with a large cloth, which was spread over the mud, and suddenly lifted by strings when the fishes hopped over it. They are astonishingly fearless, and if driven from their feeding grounds, soon return, approaching to within a few inches of one if no movement alarms them.

These fishes are very vicious towards one another, and the smaller examples were noticed to retreat before the approach of their larger fellows. From the fact that small crabs scurry into their burrows at the approach of a *Periophthalmus*, it would seem that they largely supply it with food, and one fish was observed to spring a distance of about six inches at a crab, which it secured and munched with evident relish.

At Epi, in the New Hebrides, numbers of *Periophthalmus* were observed basking together in the hot sun on top of smooth basaltic rocks, about five feet above the level of the sea. It was also noted that specimens placed in glass jars could climb the smooth surface of the glass with ease, although their ventrals are not united into sucking discs as in the gobies.

*Identity.*—The species here described and figured is the commonest Australian species of *Periophthalmus*, and has been generally identified as *P. koelreuteri*, Pallas. It appears probable, however, that several species have been united under that name, the limits and variations of which do not appear to have been satisfactorily determined, so we are not sure that our specimens are correctly identified with Pallas's species. They are apparently referable to the variety *argentilineatus*, Cuvier and Valenciennes.

*Locs.*—We have examined specimens having the same characters as those described above from the following localities. Cape Bedford, Queensland; coll. C. Hedley & E. A. Briggs, August, 1916. Cooktown, Queensland; coll. McCulloch, June, 1918. Sunday Island, King Sound, North-western Australia; coll. Dr. H. Basedow. India; Dr. Francis Day's collection. Samoa; coll. Prof. D. S. Jordan. Bougainville Island, Solomon Group; coll. Count Mörner.

#### PERIOPHTHALMODON, Bleeker.

*Periophthalmodon*, Bleeker, Arch. Neerl. Sc. Nat., ix., 1874, p. 326 (*Gobius schlosseri*, Pallas).

This genus only differs from *Periophthalmus* in having larger scales on the head and body, and in its dentition. There are about fifty rows of scales between the pectoral base and the hypural joint, and the mandibular teeth are in two rows, the outer ones being canines and the inner smaller.

*Distribution.*—Bay of Bengal to Northern Australia and the Western Pacific Ocean.

#### PERIOPHTHALMODON BARBARUS, Linné.

(Plate xxxi., fig. 2.)

*Gobius barbarus*, Linné, Syst. Nat. (12th ed.), 1766, p. 450. *Id.*, Bonnaterre, Eneycl. Meth., Ichth., 1788, p. 63, pl. xxxv., fig. 137.

*Gobius schlosseri*, Pallas, Spicil. Zool., viii., 1770, p. 1, pl. i., figs. 1-4.

*Periophthalmus schlosseri*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 192. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 100. *Id.*, Day, Fish. India, 1876, p. 304, pl. lxvi., fig. 4 (*vide* synonymy).

*Periophthalmus schlosseri*, Günther, Challenger Rept., Zool., i., 1880, p. 33. *Id.*, Garman, Bull. Mus. Comp. Zool., xxxix., 1903, p. 235.

*Periophthalmus australis*, Castelnau, Res. Fish. Aust. (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 22. *Id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 334, pl. xi., fig. 3. *Id.*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1878, p. 48. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 614, and viii., 1883, p. 206. *Id.*, Kent, Proc. Roy. Soc. Qld., vi., 1889, p. 240.

D. iv/13; A. 12; P. 16; V. i/5; C. 15. Depth 4·3 in the length to the hypural joint; head 3·1 in the same. Eye 6·2 in the head. First dorsal spine 2·1, eleventh dorsal ray 2, tenth anal ray 3·1 in the head.

Head covered with large scales, the throat naked. Eye elevated, touching its fellow on the upper profile of the head; lower eyelid distinct. Snout broad and rounded, with paired fleshy protuberances; two fleshy lobes over the upper lip, into which the anterior nostrils open. Upper lip thick, the lower with a fleshy lobe posteriorly; angle of the mouth falling below the hinder margin of the eye. Premaxillaries with several strong canines near the symphysis, followed by smaller teeth on the sides; an inner row of small teeth anteriorly. Mandibular teeth in a single row, and smaller than those of the upper jaw. Tongue adnate to the floor of the mouth. Gill-opening lateral, about as wide as the isthmus.

Body covered with scales of moderate size, which extend forward to the eyes, and onto the breast and base of the pectoral. There are fifty rows between the base of the pectoral and the hypural joint, and about fourteen between the anterior dorsal and anal rays. Genital papilla well developed.

First dorsal commencing well behind the base of the pectorals; the first spine is highest, the others decrease backward, and the space between the last and the anterior ray is equal to about two-thirds the length of the head. Second dorsal increasing in height to about the eleventh ray, which is as high as the first spine. Anal opposite and of similar form to the second dorsal, but lower. Pectoral rounded, with bifurcate rays, the median ones longest, but scarcely reaching the vertical of the vent; the lower half of the median rays is covered with stout scales. Ventrals inserted beneath the end of the operculum, the two fins completely united. Caudal rounded, its lower rays short.

*Colour*.—General colour dark brown in formaline, white below, each scale of the lower portion of the sides with a bluish centre. Dorsals, pectorals and caudal brownish, with light margins; ventrals and anal white.

Described and figured from a specimen 197 mm. long. Twelve other specimens 163-255 mm. long exhibit but little variation, though some have five instead of four dorsal spines.

*Synonymy*.—The name *Gobius barbarus*, Linné, should apparently apply to this species, and not to *P. koelreuteri*, to which it has hitherto been referred. Linné quoted no references under his *G. barbarus*, while such characters as he gives do not enable one to identify his species. Pallas later described *P. schlosseri* and *P. koelreuteri*, but his work is unfortunately not available to us. Bonnaterre, however, gave recognisable figures of both "Le Schlosser" and "Le Koelreuter," which were copied from Pallas according to Cuvier and Valenciennes<sup>2</sup>, and he attached the name *G. barbarus* to the former. As there seems to be no reason to suppose he was incorrect, we follow him in identifying Linné's species with *P. schlosseri*.

*Periophthalmus australis*, Castelnau, described from Northern Queensland, is evidently synonymous with *P. barbarus*.

<sup>2</sup> Cuvier & Valenciennes—Hist. Nat. Poiss., xii., 1837, pp. 181 and 192—footnotes.

*Locs.*—Cairns, North Queensland. Cooktown, North Queensland; coll. E. A. C. Olive. Paira Creek, Cape York; coll. Hedley and McCulloch, October, 1907. Melville Island, Northern Australia.

In addition to these localities the species has been recognised from Keppel Bay (Garman); Cardwell (Günther); Burdekin and Mary Rivers (Macleay); Cape York (Macleay); Norman River (Castelnau); Port Darwin (Macleay and Kent). Tenison Woods<sup>3</sup> intimates that the species occurs in the Richmond River, New South Wales, but this is doubtless incorrect.

BOLEOPHTHALMUS, *Cuvier & Valenciennes.*

*Boleophthalmus*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 198 (*Gobius boddaerti*, Pallas). *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 101. *Id.*, Day, Fish. India, 1876, p. 304. *Id.*, Jordan & Snyder, Proc. U.S. Nat. Mus., xxiv., 1901, p. 47.

Form moderately elongate, subcylindrical anteriorly, compressed posteriorly. Body covered with small or rather large scales, which become rudimentary anteriorly, and are obsolete on the head. Mouth of moderate size, a little oblique, the upper jaw overlapping the lower. Eyes prominent, placed high in the head, close together; lower eyelid well developed. Teeth uniserial in the premaxillaries, some of the anterior ones large and subulate, the others becoming abruptly smaller; mandibular teeth almost horizontal, flattened and usually notched at their tips; they are largest anteriorly and arranged in a row which does not curve inward posteriorly; a large inner canine on each side of the mandibular symphysis. Tongue thick and rounded, adnate to the floor of the mouth. Gill-opening lateral, separated by a broad isthmus. Dorsal fins separate, the first high, with about five spines. Second dorsal long, with 25-28 rays; anal similar to the second dorsal. Pectorals with a scaly, muscular base. Ventrals completely united.

BOLEOPHTHALMUS CAERULEOMACULATUS, *McCulloch & Waite.*

*Boleophthalmus caeruleomaculatus*, McCulloch & Waite, Rec. S. Austr. Mus., i. 1, 1918, p. 79, pl. viii., fig. 1.

*Loc.*—Adelaide River, Northern Territory.

Genus SCARTELAOS, *Swainson.*

*Scartelaos*, Swainson, Nat. Hist. Classif. Fish., ii., 1839, p. 279 (*Gobius viridis*, Buchanan).

*Boleops*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 271 (*Boleophthalmus aucupatorius*, Richardson).

<sup>3</sup> Tenison Woods—Fish and Fisheries N.S. Wales, 1882, p. 27.

Body elongate and compressed, wholly or partly covered with minute rudimentary scales which become obsolete on the head. Head large, wider than deep, opercular region swollen. Snout rounded, the upper jaw longest; mouth wide, slightly oblique, the upper lip thick and the lower thin; the jaw laterally fringed. Premaxillary teeth uniserial anteriorly, large and subulate, becoming abruptly smaller posteriorly; mandibular teeth similar but smaller, the posterior ones in a row which curves inward; a large canine on each side of the mandibular symphysis. Tongue adnate, with a rounded tip. Anterior nostril in an elongate tube situated at the outer angle of the snout. Eyes superior, protractile, contiguous. Gill-opening narrow and subvertical, the isthmus wide; five branchiostegals. First dorsal with five flexible spines, one or more of which may be produced into filaments; second dorsal low with a rudimentary spine and 26-29 rays. Anal similar to the second dorsal with 1/24-26 rays. Pectoral short and rounded with 13-21 rays and a strong muscular base. Ventrals wholly united, with 1/5 rays. Caudal cuneate, with 13-15 rays of which the lower are short and muscular. Intestinal canal long, with many convolutions. Vertebrae 25 (11+14).

*Affinities.*—*Scartelao*s is very closely allied to *Boleophthalmus*, but differs in having the mandibular teeth subulate and arranged in a row which curves inward posteriorly; the body is more elongate, and covered with only minute rudimentary scales.

In addition to the genotype, this genus includes *Boleophthalmus tenuis*, Day<sup>4</sup>, and *B. glaucus*, Day<sup>5</sup>.

*Habitat.*—Small fishes from the littoral zone of the Indian, Malayan and North Australian Seas, frequenting the mud-flats of tidal rivers.

SCARTELAO S VIRIDIS, Buchanan.

(Plate xxxii., fig. 1.)

*Gobius viridis*, Buchanan, Fish. Ganges, 1822, pp. 42, 45, 366, pl. xxxii., fig. 12.

*Boleophthalmus histiophorus*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 210.

*Boleophthalmus viridis*, Cuvier & Valenciennes, *Ibid.*, p. 213. *Id.*, Cantor, Cat. Malay. Fish., 1850, p. 195. *Id.*, Bleeker, Verh. Bat. Gen., xxv., 1853, Beng. en Hind., p. 50. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 104. *Id.*, Day, Fish. India, 1876, p. 307, pl. lxvi., fig. 5. *Id.*, Waite, Rec. Austr. Mus., iv., 1902, p. 194.

*Boleophthalmus sinicus*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 215.

*Boleophthalmus chinensis*, Cuvier & Valenciennes, *Ibid.*

*Boleophthalmus ancupatorius*, Richardson, Voy. "Sulphur," 1842, p. 148, pl. xlvi., figs. 1-2, and Rept. Ichth. China, 1846, p. 208.

<sup>4</sup> Day—Fish. India, 1876, p. 305, pl. lxv., fig. 1.

<sup>5</sup> Day—*Ibid.*, p. 306, pl. lxv., fig. 3.

*Apocryptes macrophthalmus*, Castelnau, Proc. Zool. Soc. Viet., ii., 1873, p. 87.

*Gobiosoma guttulatum*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 357, pl. ix., fig. 6.

? *Gobiosoma punctularum*, De Vis, Proc. Linn. Soc. N.S.Wales, viii., 1884, p. 449.

*Scartelaois viridis*, Jordan & Seale, Proc. U.S. Nat. Mus., xxviii., 1905, p. 794, fig. 5.

*Pseudapocryptes guttulatum*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 408.

? *Pseudapocryptes punctularum*, Jordan & Seale, *Ibid.*

D. v, i/26-27; A. i/24-26; P. 21; V. i/5; C. 17. Depth of the body 6·5-9·1 in its length<sup>6</sup>; and equal to about half the length of the head; head 3·6-4·4 in the length of the body, one-fifth to one-third wider than deep, and two-fifths to two-thirds longer than wide. Eye 3·75-5·5 in the head and shorter than the snout, which is 3·1-3·8 in the head. Breadth of the body behind the pectorals 1·2-1·5 in the depth.

Upper surface and sides of the head with non-imbricate rudimentary scales, appearing as pit-like depressions. Profile of the snout strongly rounded. Anterior border of the upper lip with eleven unequal papillæ, the lateral border crenulate. Mandible with a well developed mental barbule. Cleft of the mouth extending to below the posterior border of the eye, its length, 2·3-2·8 in that of the head. Upper jaw with seven or eight pairs of enlarged subulate teeth, which are followed by six to eight similar, but much smaller, teeth; mandible with fifteen pairs of enlarged teeth, and four smaller ones behind them; a pair of strong recurved canines at the symphysis.

Body gently tapering from the shoulders backward, and everywhere covered with minute scales.

Spinous dorsal originating above the posterior third of the adpressed ventrals; the length of its narrow base, including the small terminal membrane, is somewhat less than the length of the snout. Third dorsal spine longest, and filamentous; in the male it may extend to the eighteenth dorsal ray, its length being 2·1 in that of the body; in the female it sometimes reaches the sixth ray, and may be 3·87 in the body-length. Second dorsal rays gradually increasing to or nearly to the antepenultimate, the longest 2·2-2·8 in the head; membrane of the last ray narrowly united to the upper caudal ray. Anal originating below the second dorsal ray, and rather lower than that fin; the membrane of the last ray just reaches the base of the caudal. Median pectoral rays longest, extending to below the last dorsal spine, and 1·8-2·1 in the head. Ventrals inserted slightly in advance of the pectoral, as long as or a little longer than that fin. Middle caudal rays longest, 3·4-4·1 in the body-length.

<sup>6</sup> The body is deeper in smaller examples than in larger ones owing to the gradual elongation of the tail with age. In a specimen 68 mm. long, the vent is nearer the base of the caudal than the end of the snout; in another measuring 105 mm., it is midway between those two points, while in a 136 mm. example it is one-fourth nearer the end of the snout.

*Colour.*—Blue-grey, the upper surface usually washed with brown and bearing a few small widely scattered black spots; lips, throat, and abdominal region bluish white. Many specimens have a number of short black cross-bars on the middle of the sides, which are most developed in specimens of medium size and tend to disappear in larger ones. Posterior portion of the spinous dorsal blackish, the basal portion like the back and occasionally with a few small black spots. Soft dorsal brownish-blue, and sparsely spotted with black. Caudal bluish-grey, the inferior rays white, and with numerous black spots arranged in irregular transverse series. Anal and ventrals yellowish-white. Pectorals dark grey, with a broad lighter border and some black spots on the base.

Described from eight examples 68-140 mm. long from the Burnett River Heads; the figure represents one of these 136 mm. long.

*Synonymy.*—We have examined the eight co-types of *Gobiosoma guttulatum*, Macleay, and find them similar to the specimens described in all details; in Macleay's figure, the angulated muscle-bars are too pronounced, their appearance being exaggerated by contraction due to the effects of their preservative fluid. The type of *G. punctularum*, De Vis, cannot be found in the collection of the Queensland Museum; its brief description suggests that it is synonymous with *S. viridis*, the differences noted between it and *G. guttulatum* being apparently of little value. Castelnau's description of his *Apocryptes macrophthalmus* from Port Darwin leaves little doubt that that species also is synonymous with *S. viridis*.

*Habits.*—These little fishes frequent mud-flats and mangrove swamps, and so soon as the receding tide leaves the flats uncovered, they emerge from the holes in which they lie concealed during the prevalence of the flood. They traverse the mud with astonishing rapidity, their powerful pectoral, ventral and caudal muscles enabling them to leap and bound over its yielding surface in search of the small creatures on which they subsist. They can extrude or retract the eyes at will, and we are informed by Dr. Bancroft that they can partly raise themselves upon their ventral fins and tail so as to gain a wider outlook. He also notes that they hold the spinous dorsal fully erect when moving over the mud. Dassumier<sup>7</sup> observed these fishes in the delta of the River Ganges, and wrote:—“They are abundant on the mud-flats, over which they skip in pursuit of small crustaceans; when an attempt is made to capture them they bury themselves with great celerity in the mud, or if that be to hard they hurriedly seek a crab-hole, in which to take refuge: when they are in the water they frequently raise the head above the surface.” Referring to this latter peculiarity Dr. Bancroft writes:—“When pursued it skips into the water, swims a few feet, and then protrudes its head with its goggle-eyes thrust forth to their full extent; and from this point of vantage, it stares impudently at its would-be captor.” Writing of an allied species, *Boleophthalmus pectinirostris*, Jordan<sup>8</sup> says:—“The animal has the power of skipping along over the wet sands and mud, even skimming with great speed over the surface of the water. It chases its insect prey among rocks, leaves and weeds, and out of the water is as agile as a lizard.”

<sup>7</sup> Cuvier & Valenciennes—Hist. Nat. Poiss., xii., 1837, p. 213.

<sup>8</sup> Jordan—Guide Study of Fishes, ii., 1905, p. 465.

According to Dussumier, the natives of Surat consume large quantities of these fishes in a salted or dried state, mixing them with boiled rice.

*Locs.*—Deception Bay and Burnett River Heads; coll. Dr. T. L. Bancroft. Other specimens are in the Queensland Museum from the estuaries of the Brisbane River, Pioneer River, Barron River, and the Ross River at Townsville. The co-types of *Gobiosoma guttulatum*, Macleay, were secured at Port Darwin, which is also the locality of *Apocryptes macropthalmus*, Castelnau. Waite recorded the species from Broome and the Lennard River, North-Western Australia.

*Distribution.*—From the West Coast of India to the Malay Peninsula and the China Sea; New Guinea, North and North-Eastern Australia.

#### Subfamily GOBIINÆ.

The subfamilies Gobiinæ and Eleotrinæ have been regarded as well defined families by some authors, they being separated on the structure of their ventral fins. In the Gobiinæ, the ventrals are juxtaposed and usually united into a complete disc, which is generally supplemented by an anterior membrane connecting the spines; further, the fifth rays are generally as long as the fourth. In the Eleotrinæ the ventrals are separate; there is no anterior membrane, and the fifth ray is shorter than the fourth. Were these characters constant, the subdivision of the two groups would present no difficulties, but in some species the ventral structures are more or less intermediate between the two types.

The highly specialised *Callogobius sclateri*, which has hitherto been regarded as an Eleotrid, is very similar in all its major characters to the other species of the genus, but has eleotrid ventrals as defined above though there is a membrane connecting the bases of the inner rays; in *C. hasseltii* the fourth ray is distinctly longer than the fifth, but the ventrals are otherwise of gobioid form. In *Zonogobius* the ventrals are completely united, but the fifth ray is shorter than the fourth; in the typical form *Z. semidoliatus*, there is no trace of an anterior membrane between the spines, but this structure is well developed in *Z. nuchifasciatus*. The ventrals of *Quisquilius eugenius* are similar to those of *Z. semidoliatus*, but it has been regarded as an Eleotrid by Jordan and his colleagues though Weber associates it with the Gobies.

These intermediate forms are few in number, however, and the greater mass of species of both groups are readily separable into one or the other section. Under these circumstances, it seems unnecessary to maintain separate families for the Eleotrids and Gobies, though they can be conveniently classified as subfamilies, distinguished by the complete or partial junction (Gobiinæ), or the complete separation of their ventral fins (Eleotrinæ).

Provisional key to the Australian genera and species known to the authors.

- a. Soft dorsal and anal long, partly united with the caudal; D. vi/38-48. Body anguilliform, naked. Eyes minute, teeth long and curved.
- b. Head with prominent raised papillose ridges.....*Leme*, spp.

- bb.* Head without such ridges.....*Taenioides*, sp.
- aa.* Soft dorsal and anal shorter, free from the caudal.
- c.* Body naked, compressed and elevated.....*Gobiodon*, spp.
- cc.* Body scaly.
- d.* Chin and mandible with barbels, cheeks and opercles scaly.....  
*Parachaetrichthys*, sp.
- dd.* Chin and mandible without barbels.
- e.* First dorsal with 7-8 spines.....*(Gobius) pictus*.
- ee.* First dorsal with 6 spines.
- f.* Head with very prominent raised papillose ridges.....*Callogobius*, sp.
- ff.* Head with only microscopic papillæ in rows.
- g.* Opercles scaly, cheeks naked or scaly.
- h.* Cheek scales large and distinct.....*Exyrius*, sp.
- hh.* Cheek scales indistinct or wanting.
- i.* Forty or more scales in a longitudinal row.....*Mugilogobius devisi*.
- ii.* Less than forty scales in a longitudinal row.
- j.* Head subcylindrical posteriorly, about as broad as deep.
- k.* Scales of nape and operculum small.....*Mugilogobius galwayi*.
- kk.* Scales of nape and operculum enlarged.....*(Gobius) flavesceens*.
- jj.* Head compressed, deeper than broad.....*(Gobius) australis*.
- gg.* Opercles naked or nearly naked, cheeks naked.
- l.* Exposed edge of shoulder-girdle with fleshy lobes.....*Iwaous*, sp.
- ll.* Exposed edge of shoulder-girdle smooth.
- m.* Upper pectoral rays free and silk-like.
- n.* Tongue truncate or rounded anteriorly.....*Gobius*, sp.
- nn.* Tongue emarginate anteriorly.....*Mapo*, spp.
- mm.* Upper pectoral rays not free nor differentiated from the others.
- o.* Tongue deeply notched anteriorly.....*Glossogobius*, spp.
- oo.* Tongue not deeply notched.
- p.* Head subspherical, with spines or large papillæ.....*Paragobiodon*, sp.
- pp.* Head longer, without spines or large papillæ.
- q.* Scales larger, 36 or less in a longitudinal row.
- r.* Nape and greater portion of neck naked.
- s.* Gill-openings extending well forward below, fifth ventral ray shorter than the fourth.....*Zonogobius*, sp.
- ss.* Gill-openings not extending forward below, fifth ventral ray as long as the fourth.
- t.* Breast and pectoral base naked.....*(Gobius) lidwilli*.
- tt.* Breast and pectoral base scaly.
- u.* Caudal pointed, body longer.....*(Gobius) bifrenatus* and  
*(Gobius) semifrenatus*.
- uu.* Caudal rounded, body shorter.....*Rhinogobius*, spp.
- rr.* Nape and neck scaly.
- v.* Snout pointed, maxilla extending to below the orbital border.....  
*(Gobius) neophytus*.
- vv.* Snout obtuse, maxilla extending beyond the orbital border.....  
*(Gobius) lateralis*.

- qq. Scales smaller, more than 36 in a longitudinal row.
- w. Mouth very large, maxilla produced backward toward the preoperculum.....*Waitea*, sp.
- ww. Mouth normal, maxilla not specially produced.
- x. About 15 dorsal and anal rays, snout tumid, caudal rounded.....*Ambylygobius*, spp.
- xx. 13 or less dorsal and anal rays, snout normal.
- y. Scales minute, about 90 in a longitudinal row.....*Cryptocentrus*, sp.
- yy. Scales larger.
- z. Nape scaly.....*Oxyurichthys*, spp.
- zz. Nape naked.....(*Gobius*) *eremius*.

Genus LEME, *De Vis.*

*Leme*, De Vis, Proc. Linn. Soc. N.S. Wales, viii., 1883, p. 286 (*L. mordax*, De Vis).

Body elongate, subcylindrical anteriorly, compressed posteriorly. It is wholly naked; lateral line defined by a groove along which are fleshy swellings on the tail portion. Head subquadrilateral, with raised ridges of papillæ radiating from the eye, on the cheeks, opercles and mandible. Eye obsolete. Mouth very oblique, with broad lobulate lips; mandible with barbels. An outer row of subulate teeth in each jaw, followed by a narrow band of villiform ones; no teeth on the palate. Tongue thick, rounded anteriorly, largely adnate to the floor of the mouth. Gill-openings broad, lateral, separated by a wide interspace; exposed edge of shoulder-girdle smooth. Four branchiostegals. One long dorsal fin, with six spines and about 38-48 branched rays, the last united with the caudal base. Anal similar to the soft dorsal. Pectorals well developed, with bifurcate rays. Ventrals united into a large disc, with one spine and five rays. Caudal well developed, pointed.

This genus is very near *Taenioides*, Lacepède, but differs in having prominent ridges of papillæ on the head.

- a. About 48 dorsal rays; head about  $9\frac{1}{2}$  in total length.....*mordax*.
- aa. About 37 dorsal rays; head about 7 in total length.....*purpurascens*.

LEME MORDAX, *De Vis.*

(Plate xxxi., fig. 4.)

*Leme mordax*, De Vis, Proc. Linn. Soc. N.S. Wales, viii., 1883, p. 286.

D. vi/48; A. 46; P. 16; V. i/5; C. 15. Length to the vent 2·4 in the tail. Head, measured from the premaxillary symphysis to the upper angle of the gill-opening, 9·4 in the total length, and 1·8 in its distance from the vent. Depth before the ventrals 1·7, pectoral 3·2, and ventrals 1·2 in the head.

Head subquadrilateral, with raised ridges of papillæ which are disposed as in the accompanying illustration of *L. purpurascens*. Anterior nostril opening in a fleshy lobe behind the upper lip, the posterior a larger

pore before the eye. Eye minute, hidden in the skin on the upper surface of the head. Mouth subvertical, with broad lobate lips; lower jaw projecting. Mandible with three paired barbels increasing in size backward, and one almost between the median pair. An outer row of exposed subulate teeth in each jaw, which are largest towards the symphyses; these are followed by a band of villiform teeth which is widest anteriorly and narrows laterally; palate toothless. Gill-openings separated by a space equal to that between the posterior nostrils.

Body wholly naked, lacking even rudimentary scales. A lateral line is indicated by a groove upon which are large fleshy swellings on the tail portion. A small genital papilla.

Dorsal fin commencing above the end of the ventrals, the distance separating it from the gill-opening a little less than that between the latter point and the snout; the five anterior spines increase regularly in length, the sixth is shorter than the fifth and widely separated from the others; they are completely united with each other and with the rays by a thick membrane. Dorsal rays branched, increasing in length to about the middle of the fin, then decreasing backward; the last is united with the base of the caudal by membrane, but its tip forms a free lobe. Anal similar to the soft dorsal. Pectoral small, rounded, with branched rays. Ventrals large, completely united, with a broad basal membrane. Caudal pointed.

Colourless after long preservation in alcohol.

Described and figured from a specimen 218 mm. long, from Ripple Creek, Herbert River, Queensland, which is very close to the Murray River whence the typical example was obtained. It differs from De Vis' description in being wholly naked and in having branched rays in all the fins; the head is less than one-ninth of the total length instead of one-eighteenth, and there are no palatine teeth. Notwithstanding these discrepancies, it seems probable that the specimen is correctly identified as *L. mordax*.

*Variation*.—A second specimen from Cooktown, 190 mm. long, is very similar, but lacks the median mandibular barbel. The head is one-tenth of the total length and it has vi/47 rays in the dorsal fin and 46 in the anal.

*Locs.*.—Ripple Creek, Herbert River, and Cooktown, Queensland.

LEME PURPURASCENS, *De Vis.*

(Plate xxxi., fig. 3.)

*Leme purpurascens*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 698.

*Gobiooides purpurascens*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 36. *Id.*, Waite, Mem. N.S.Wales Nat. Club, ii., 1904, p. 46.

*Amblyopus niger*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 698.

D. vi/37; A. 36; P. 16?; V. i/5; C. 15? Length to the vent 1.8 in the tail. Head, without the mandible, 7 in the total length, and 1.6 in its distance from the vent. Depth before the ventrals 1.8, pectorals 3, and ventrals 1.09 in the head.

This species appears to differ from *L. mordax* principally in its proportions, and in having fewer dorsal and anal rays. The dorsal fin commences a little farther forward, and the median mandibular barbels are paired on each side.

The above proportions are those of a specimen 185 mm. long, from the Richmond River. The illustration is prepared from a small example 92 mm. long, from an unknown locality, in which the cephalic ridges are well preserved.

*Synonymy*.—We have examined the holotype of *Amblyopus niger*, De Vis, and find it quite similar to the specimens described and figured. It is much shrivelled and quite black, but has the cephalic ridges and other characters of *L. purpurascens*.

*Locs.*.—Richmond River, New South Wales; coll. Mr. Thomas Temperley, 1887. Nowra, Shoalhaven River, New South Wales; coll. Mr. John Baxter.

Genus *TÆNIOIDES*, *Lacepède*.

*TÆNIOIDES RUBRISTRIATUS*, *Kent*.

*Amblyopus rubristriatus*, Kent, Proc. Roy. Soc. Qld., vi., 1889, pp. 223, 235, pl. xiii., fig. 5.

This briefly characterised species has not been recognised since it was first secured by Kent in the Cambridge Gulf, North-western Australia. It is perhaps incorrectly associated with *Tænioides*.

Genus *GOBIODON*, *Bleeker*.

*Gobiodon*, Bleeker, Nat. Tijdschr. Ned. Ind., xi., 1856, p. 407 (*Gobius histrio*, Cuv. & Val.).

*Pseudogobiodon*, Bleeker, Arch. Neer. Sc. Nat., ix., 1874, p. 309 (*Gobius citrinus*, Rüpp.).

*Ellerya*, Castelnau, Proc. Zool. Soc. Vict., ii., 1873, p. 95, and Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 21 (*E. unicolor*, Cast.).

General form short and compressed; body naked, but covered with a thick granular mucous, which when removed, may leave small pits in the skin resembling rudimentary scales. Head compressed, the profile rounded; mouth a little oblique, jaws subequal. Large tubular pores open between the nostrils, on the interorbital space, behind the eye, and around the preopercular border; lower margin of the preoperculum and mandible with minute papillæ. Teeth in a narrow band in each jaw, the outer row of which is largest; a few stronger inner teeth on each side of the mandibular symphysis. Tongue partly free, truncate or rounded anteriorly. Gill-opening opposite and as wide as the pectoral base, isthmus very broad; shoulder-girdle smooth. Dorsal with six spines and about eleven rays; anal similar to the dorsal. Ventrals small, cup-shaped. Caudal and pectorals rounded.

*Synonymy.*—*Pseudogobiodon citrinus* has been separated from *Gobiodon* because it has no canines. Though its inner enlarged mandibular teeth are smaller and less caniniform than in the typical species of *Gobiodon*, they are nevertheless similar in both structure and position, and we do not regard them as sufficiently characteristic to justify the maintenance of the genus. *Ellerya*, Castelnau, is inaccurately and superficially defined, but is evidently based upon a species of *Gobiodon* (see notes under *G. verticalis*).

Key to the Australian species.

- aa. First dorsal rounded, the fifth spine highest.
  - b. Colour lighter, usually with traces of five broad darker bars across the head and pectoral base; body very deep, head deeper than long.....*verticalis*.
  - bb. Colour darker; head uniform or with narrow blue lines across the sides and pectoral-base; body less elevated, head about as deep as long.
    - c. Head and pectoral-base with five light dark-edged lines.....*quinquestrigatus*.
    - cc. Head uniform or with indistinct lines.....var. *ceramensis*.
- aa. First dorsal angular, the anterior spines highest.
  - d. Head and pectoral base with four blue cross-lines.....*citrinus*.

GOBIODON VERTICALIS, Alleyne & Macleay.

(Plate xxxii., fig. 2.)

? *Ellerya unicolor*, Castelnau, Proc. Zool. Soc. Viet., ii., 1873, p. 95.

*Gobiodon unicolor*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 613.

*Gobiodon verticalis*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 333, pl. xii., fig. 4. *Id.*, Macleay, *Loc. cit.*, v., 1881, p. 612.

*Pseudogobiodon verticalis*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 410.

*Gobius douglasi*, Kent, Great Barrier Reef, 1893, p. 310, pl. xvi., fig. 12.

D. vi/11; A. 10; V. i/5; P. 19; C. 17. Depth before the ventrals 2·2 in the length to the hypural joint; head 3·5-3·6 in the same. Eye 4·6-4·7 in the head, and subequal to its distance from the premaxillary symphysis; interocular space equal to the eye diameter. Caudal peduncle as deep as long. Breadth before the pectorals 2·6-2·7 in the height.

Head much deeper than long, greatly compressed; the profile of the muzzle is subvertical and the forehead and chin are very convex and equally rounded. Nostrils in low tubes, the posterior placed just before the eye, the anterior nearer the upper lip. A series of several large tubular pores extends around the preopercular border to behind the eye; two others are on the interorbital space, and a pair between the posterior nostrils. Microscopic papillæ are present on the lower preopercular border, and beneath the lower lip. Interocular space very convex. Mouth a little oblique, the jaws equal; maxilla extending backward to below the anterior half or the middle of the eye. Each jaw with a narrow band of teeth, the outer row of which is strong, the others villiform; an enlarged curved canine on each side of the mandibular symphysis. Gill-opening as wide as the base of the pectoral.

Body strongly compressed, naked; twenty-four myotomes are distinct in the preserved specimens between the axil and the hypural joint. Genital papilla large. The whole surface of the head and body is covered with a thick granular mucous which obscures the characters beneath it.

First dorsal commencing above the base of the pectoral. The spines are weak, and increase in length to the fifth; the sixth is separated from the fifth by a wide interspace, and is broadly united with the first ray by membrane. Soft dorsal rounded, all its rays except the first branched, the ninth longer than the postocular portion of the head. Anal commencing behind and terminating before the soft dorsal, to which it is similar in form. Caudal broadly rounded. Pectorals rounded, the median rays longest and reaching to below the third dorsal ray. Ventrals small, cup-shaped, with a broad basal membrane; their length is variable, the median rays reaching from half to three-fourths of their distance from the vent.

*Colours.*—Bleached after long preservation in alcohol, with only faint indications of the five broad darker cross-bars on the head and pectoral base, which are disposed as illustrated in the accompanying figure; there are also traces of about five irregular undulating longitudinal stripes on the body in some specimens. Opercular lobe with or without a dark spot.

Described from the six cotypes of the species, 39-46 mm. long, in the Macleay Museum. The figure represents a well preserved example 47 mm. long, from Green Island off Cairns.

*Variation.*—The brilliant green and scarlet colouration of this species in life is wholly lost in preserved specimens, and only occasionally are traces of the colour-marking retained. In some specimens from Murray Island, the broad dark bars on the head and base of the pectoral, which are usually indistinct or wanting, are well defined: the scarlet spots are represented by areas defined by microscopic grey dots, and may be irregularly distributed as in the figure or may coalesce to form more or less regular longitudinal lines. The dorsal and anal fin-rays vary from 11-12 and 10-11 respectively.

*Synonymy.*—The original description of *Ellerya unicolor*, Castelnau, is inaccurate and superficial, and although emended later by its author, is too general to allow of the species being definitely recognised without reference to the type. The specimens recorded by Macleay as *G. unicolor* from the Endeavour River do not differ from his cotypes of *G. verticalis*, and suggest that the two species are identical; if this be so, Castelnau's name will take precedence. Kent's figure of *Gobius douglasi* leaves no doubt as to the identity of that species with *G. verticalis*, and illustrates the characteristic brilliant colouration of the living fish. The similarity of the cotypes of *G. verticalis* and Cuvier & Valenciennes' figure of *G. histrio*<sup>9</sup> is very striking, and the two species are very probably identical; but as we lack Bleeker's important paper on the synonymy of the several closely allied species of *Gobiodon*, we prefer to use Macleay's name until further details of the characters of *G. histrio* are available.

<sup>9</sup> Cuvier & Valenciennes—Hist. Nat. Poiss., xii., 1837, p. 132, pl. ccclvii.

*Habits*.—This brilliant little fish is not uncommon among the branches of living madrepores on the Queensland Coast. Macleay found specimens in the innermost recesses of dead coral at Darnley Island, where, he considered, they had probably been born, though this conclusion seems to be unwarranted. They are always covered with a very thick mucous in which are closely packed granules resembling ova, though their microscopic structure appears to differ from that of true eggs.

*Locs*.—Darnley Island, Torres Strait; cotypes of *G. verticalis*. Murray Island, Torres Strait; coll. Hedley & McCulloch. Endeavour River, Cooktown; Macleay Museum, as *G. unicolor* (Castl.), Macleay. Green Island, off Cairns. North West Island, off Port Curtis; coll. H. Burrell.

GOBIODON QUINQUESTRIGATUS, *Cuvier & Valenciennes*.

(Fig. 4.)

*Gobius quinquestrigatus*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 134.

*Gobiodon quinquestrigatus*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 61. *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 454 (synonymy).

D. vi/11; A. 9; P. 18; V. i/5; C. 17. Depth before the ventrals 2·8 in the length to the hypural joint; head 3·5 in the same. Eye 4 in the head and subequal to the snout; interocular width 1·3 in the eye. Depth of the caudal peduncle 1·2 in its length. Breadth before the pectoral base 2·1 in the height.



Fig. 4. *Gobiodon quinquestrigatus*.

Head longer than deep, compressed; upper profile very convex, chin prominent. Nostrils tubular, the posterior placed just before the eye. A series of six large tubular pores extends around the preopercular border to behind the eye; two others are on the interorbital space, and a pair between the nostrils. Microscopic papillæ are present on the lower preopercular margin, beneath the eye, and around the mouth to below the lower lip. Interorbital space a little convex. Mouth slightly oblique, the maxilla extending to below the anterior half of the eye; mandible not quite so long as the upper jaw. Each jaw with a narrow band of villiform

teeth, and an outer row of stronger ones; one or two inner canines are present on the mandibular symphysis. Gill-opening slightly narrower than the pectoral base.

Body strongly compressed, naked. About twenty-three vertical series of minute pores, arranged along the median line between the axil and the hypural joint, represent the lateral line. Genital papilla large.

Fins largely damaged. First dorsal commencing a trifle behind the base of the pectoral; the spines are weak, the fifth apparently highest, and the sixth separated by a wide interspace from the fifth. Membrane connects the last spine with the basal portion of the first ray. Dorsal rays branched, the last double. Anal, caudal and pectorals with branched rays. Ventrals small, cup-shaped, with a broad basal membrane, and originating behind the pectoral base.

*Colour*.—Brown in alcohol, the head a little lighter than the body. Two light narrow lines with darker borders extend across the cheek from the eye to the lower surface of the head; another short one is present behind the eye; two longer curved ones cross the opercles from the side of the neck, and another extends across the base of the pectoral. Fins somewhat darker than the body, the soft dorsal with an indefinite light basal stripe.

Described and figured from a specimen  $28\frac{1}{2}$  mm. long without the caudal fin.

*Loc.*—Cairns Reef, off Cooktown, Queensland; coll. A. R. McCulloch.

**GOBIODON QUINQUESTRIGATUS, var. CERAMENSIS, Bleeker.**

*Gobius ceramensis*, Bleeker, Nat. Tijd. Ned. Ind., iii., 1852, p. 704.

*Gobiodon ceramensis*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 88, and Fische Südsee, vi., 1877, p. 182, pl. cix., fig. d. *Id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i., 1877, p. 333. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxxi., 1879, p. 384. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 409.

Proportions of a specimen 34 mm. long, from Murray Island. Depth before the ventrals 2·7 in the length to the hypural joint; head 3·4 in the same. Eye 4·1 in the head, and equal to the snout and the interorbital space. Caudal peduncle as deep as long. Breadth before the pectorals 2·6 in the height. Median dorsal spines 2·2, median dorsal rays 1·6, seventh anal ray 1·5 in the head. Pectoral 1·2, caudal 1·3 in the head.

Five specimens 29-34 mm. long, taken together at Murray Island, are brown in colour, the head and thoracic region being lighter. Cross-lines on the head as in the typical form may be traceable, but are usually wanting. The fins are similar to or darker than the body.

This variety differs from the typical form only in being more uniformly coloured, the head markings being usually absent.

*Locs.*—Murray Island, Torres Strait; coll. Hedley and McCulloch. Darnley Island, Torres Strait; Macleay Museum Collection.

Klunzinger has recorded this variety from Port Denison.

GOBIODON CITRINUS, *Rüppell*.

*Gobius citrinus*, Rüppell, Neuewirbelth. Fisch., 1838, p. 139, pl. xxxii., fig. 4.

*Gobiodon citrinus*, Klunzinger, Verh. Zool. Bot. Ges. Wien, 1871, p. 40.

*Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 87, and Fische Südsee, vi., 1877, p. 181, pl. cix., fig. e. *Id.*, Day, Fish. India, 1876, p. 298, pl. lxiv., fig. 2. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 613.

*Pseudogobiodon citrinus*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 410.

D. vi/11; A. 10; P. 19; V. i/5; C. 17. Depth before the ventrals 2·3 in the length to the hypural joint; head 3·1 in the same. Eye 3·8 in the head, shorter than its distance from the premaxillary symphysis; interocular space a trifle wider than the eye. Caudal peduncle a little deeper than long. Breadth before the pectorals 2·06 in the height.

Head deeper than long, compressed; the profile of the muzzle obtusely rounded, the upper and lower surfaces evenly oblique. Nostrils in low tubes, the posterior in front of the eye, the anterior nearer the upper lip. Several large pores are arranged around the preopercular border and behind the eye; two others are on the interorbital space, and a pair between the nostrils. Microscopic papillæ are present on the lower preopercular border and beneath the lower lip. Interocular space nearly flat. Mouth a little oblique, jaws subequal; maxilla extending backward to below the anterior portion of the eye. Each jaw with a narrow band of villiform teeth, some of the outer ones being a little enlarged; three inner subcaniniform teeth on each side of the mandibular symphysis. Gill-opening narrower than the base of the pectoral.

Body strongly compressed, naked; together with the head and fins, it is covered with a thick granular mucous which obscures the characters beneath it. Genital papilla large.

First dorsal commencing above the end of the opercle; the anterior spine highest, the others decreasing evenly backward; the last is separated by a wide interspace from the fifth, and is united with the base of the first ray by membrane. Soft dorsal rounded, and longer than high; all the rays except the first are branched, and the median ones are much longer than the postorbital portion of the head. Anal commencing behind, and terminating before the soft dorsal; the rays increase in length to the eighth, which is longer than the base of the fin. Caudal rounded. Pectoral rounded, reaching to below the sixth dorsal ray. Ventrals with a broad basal membrane, the median rays reaching the vent.

*Colour*.—Brown in alcohol, with four pale dark-edged lines on the head and thoracic region; two extend through the eye, the first to behind the mouth, and the second across the cheek; the third descends from the upper surface of the neck to cross the end of the operculum, and the fourth from the shoulder across the base of the pectoral. The opercular lobe bears a distinct black spot. Pale dark-edged lines extend along the bases of the dorsal and anal fins. Fins dark brown; the first dorsal has

a black edge followed by a lighter inner border, which marking is also present, though less distinct, on the second dorsal and upper and lower margins of the caudal.

Described from a well preserved specimen, 48 mm. long, from Murray Island.

*Variation.*—Two smaller specimens, 32 mm. long, which were taken with the example described, are lighter in colour, the general tint being yellowish, though their markings are similar; the first dorsal is markedly angular owing to the greater length of the anterior spines, and the pectorals are longer and more pointed; the eye also is proportionately larger. Another specimen 40 mm. long, is intermediate between the two extremes.

*Locs.*—We have examined a series of ninety-six specimens in the Australian Museum from the following localities. Murray Island, Torres Strait; coll. Hedley & McCulloch. Samoa; Jordau & Seale Coll. New Hebrides; coll. Cummins & Stevens. Solomon Islands. Nicobar Islands; Dr. Francis Day's Coll. Seychelles; exch. Paris Museum.

Macleay recorded this species from the Endeavour River estuary, North Queensland.

Genus *PARACHAETURICHTHYS*, Bleeker.

*Parachaeturichthys*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 325  
(*Chaeturichthys polynema*, Bleeker). *Id.*, Jordan & Snyder, Proc. U.S. Nat. Mus., xxiv., 1902, p. 103.

Body moderately compressed; scales large, ctenoid on the body, cycloid on the nape and breast. Head not depressed, cheeks and opercles with cycloid scales; cheeks with horizontal series of mucigerous pores. Eyes superolateral; interorbital space not wide. Mouth moderate, oblique; jaws equal, the lower with small barbels. Each jaw with a band of villiform teeth, and an outer series of enlarged teeth anteriorly. Tongue with the tip free and rounded. Gill-openings not continued forward below; isthmus wide. Inner edge of shoulder-girdle smooth. Dorsal fins short, the spines not produced, with vi/1,10 rays; anal similar to the soft dorsal, with 1,9 rays. Caudal long and pointed. Pectorals pointed, with 21-22 rays, none free or silk-like. Ventrals united, free from the abdomen.

*PARACHAETURICHTHYS POLYNEMA*, Bleeker.

*Chueturichthys polynema*, Bleeker, Verh. Batav. Gen., xxv., 1853, Japan p. 44, fig. 4.

*Gobius polynema*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 46. *Id.*, Day, Fish. India, 1876, p. 286, pl. lxi., fig. 8.

*Parachaeturichthys polynema*, Bleeker, Verh. Akad. Amst., xviii., 1879, Japan p. 19. *Id.*, Jordan & Seale, Proc. U.S. Nat. Mus., xxiv., 1902, p. 103.

D. vi/1,10; A. i,9; P. 21. 28 scales along the middle of the body, and 8 between the anterior dorsal and anal rays.

Depth of the body 5·33 in its length, and 1·4 in the head. Head 3·83 in the length of the body, its width 1·63 in its length. Eye 3·67 in the head, one-fifth longer than the snout, which is 4·5 in the head; interorbital space three-fifths of the eye-diameter. Caudal peduncle about five-eighths longer than deep, its depth 8·5 in the body-length. Fourth dorsal spine 1·77 in the head, pectoral a trifle shorter than the head. Caudal 2·57 in the body-length.

Head a little wider than deep, and wider than the body, its fronto-occipital profile feebly rounded, that of the nape linear. Cheeks and opercles covered with large cycloid scales. Cheeks with three horizontal series of mucigerous pores; parietal groove with two open pores, the anterior very large and elliptical, the posterior rounded; hinder limb of preoperculum with three open pores. Eye large, longitudinally elliptical; interorbital region moderate, concave. Snout short and blunt, with a rounded and strongly acclivous profile. Jaws equal, the maxilla extending to below the middle of the eye; lower surface of the head with about three pairs of short barbels inserted below the posterior half of the mouth. Each jaw with a band of villiform teeth, the exterior row on the sides of each premaxillary being a little enlarged; an outer row of strong, curved, subulate teeth anteriorly in each jaw, the posterior larger, and subcanini-form on each side of the mandible. Tongue with the tip free and rounded. Gill-openings not continued forward below, separated by a wide isthmus; exposed edge of shoulder-girdle entire.

Body slender, compressed, the dorsal contour slightly more arched than the ventral. It is covered with large ctenoid scales, which become cycloid on the nape and breast.

First dorsal originating well behind the pectoral base; its spines are low, and its outline rounded; fourth spine longest, about as long as the base of the fin and not reaching the second dorsal when depressed. Outer border of second dorsal linear, the rays gradually increasing in length to the penultimate; this is much longer than the last, once and a half as long as the fourth spine, and three-fourths as long as the base of the fin. Anal commencing below the second and terminating below the ninth dorsal ray; the penultimate ray is longest, but shorter than that of the dorsal, 1·3 in the basal length of the fin, which is 3·7 in the body-length. Pectoral pointed, the middle rays longest, and extending to below the origin of the second dorsal. Ventral inserted a little in advance of the pectoral base, three-fourths as long as the pectorals, and not reaching the vent. Caudal long and pointed.

*Colour-marking*.—Brown, darkest above. The fins are darker, and the upper caudal rays have a large elliptical blackish yellow-edged ocellus near the base.

Described from two examples, 108-120 mm. long, in the Queensland Museum.

*Locs.*—Somerset, North Queensland; coll. Kendall Broadbent. An Indian example from Bombay, in the Australian Museum, was identified by Dr. Day.

*Distribution.*—Eastern coast of India to China and Southern Japan, North-eastern Australia.

(*GOBIUS*) *HINSBYI*, *Johnston*.

(Plate xxxiii., fig. 1.)

*Gobius pictus*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 124 (Not *G. pictus*, Malm, 1863). *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 599. *Id.*, Lucas, Proc. Roy. Soc. Vict. (2), ii., 1890, p. 28.

*Gobius hinsbyi*, Johnston, Proc. Roy. Soc. Tasm., 1902 (1903), abstract p. x.—*Nomen nudum*.

D. vii/9; A. 9; P. 19; V. i/5; C. 13. 50 rows of scales between the axil and the hypural joint, and about 15 between the anterior dorsal and anal rays.

Depth before the ventrals 5·4 in the length to the hypural joint; head 3·5 in the same. Eye 4 in the head, a little shorter than the snout which is 3·3 in the head. Depth of the caudal peduncle 3·3 in the head. Breadth before the pectorals 1·08 in the depth.

Head subcylindrical, about as deep as broad. Operculum covered with small scales, and a few are present on the cheeks, but they are more or less completely hidden in mucous. Rows of mucigerous papillæ extend across the cheeks and opercles, and around the preopercular border. Some open pores are present on the interorbital region, around the eye, and along the nuchal groove. Eyes close together, the interorbital space being a narrow ridge. Snout convex, obtusely conical. Nostrils rather close together, the anterior in a short tube midway between the eye and the preorbital, the posterior a simple opening. Mouth a little oblique, the mandible a little shorter than the upper jaw; the maxilla reaches to below the posterior nostril. Teeth subequal in size, in three or four rows in the anterior part of each jaw which are reduced to one or two as they extend backward. Tongue rounded and free anteriorly. Gill-openings continued well forward below, and separated by a narrow isthmus which is much narrower than the eye. Exposed edge of the shoulder-girdle smooth.

Body robust, subcylindrical anteriorly, compressed posteriorly. The scales are small and ctenoid, and extend forward to the nape behind the eye; they also cover the breast and the base of the pectoral, where they are smaller and cycloid. Caudal peduncle more than three times as long as deep. Genital papilla large and pointed.

Dorsal fin originating above the anterior half of the pectoral; it is rounded, and the third spine is longest but does not reach the second dorsal when adpressed. Dorsal rays increasing in length backwards, the second about equal to the length of the base of the fin, and a little higher than the longest spine. Anal opposite the second dorsal and of similar

form. Pectorals rounded, reaching to about midway between the two dorsal fins. Ventrals larger than the pectorals, with a broad basal membrane, and reaching to the origin of the anal. Caudal feebly rounded.

*Colour-marking*.—Light olive on the back, whitish on the sides and under surfaces; the upper parts are closely freckled with grey dots and lines, which unite to form about five darker cross-bars on the back. The middle of the sides bear five darker blotches formed of black dots, the most pronounced of which is at the base of the tail. The sides are vertically barred with about thirteen grey stripes, which are most pronounced anteriorly. A dark stripe extends from the eye to the preorbital, and another descends across the operculum. First dorsal with many small grey dots between the rays; on the second they tend to form larger spots. Caudal and pectoral with transverse rows of grey spots on the rays. Anal and ventral colourless.

Described and figured from a specimen 86 mm. long, from Wedge Bay, Tasmania.

*Variation*.—A series of twenty-five specimens, 33-62 mm. long, taken with the larger example described, exhibits considerable variation in the colour-marking, and in the numbers of spines and rays in the vertical fins. The vertical transverse bars may be either wholly wanting, or they may be even more distinct and more regularly arranged than illustrated, and they sometimes meet on the dorsal and ventral surfaces so as to form complete annuli around the body. The lateral blotches vary in their intensity, and are sometimes much larger than in the figured specimen, particularly in those which lack the vertical bars. In six examples we count D. viii/11-12; A. 11-12 instead of vii/9 and 9 as described above.

*Identity and synonymy*.—These specimens agree with Castelnau's description in most details, and the fact that they have eight dorsal spines leaves little doubt that they are correctly identified as *G. pictus*. The type of *G. hinsbyi* is preserved in the Tasmanian Museum, and has been examined by one of us; though in a very bad state of preservation, it leaves no doubt as to its identity with the specimen described above.

*Loc.*—Wedge Bay, Hobart, Tasmania, 5-10 fathoms; coll. C. Hedley, April, 1917. Queenscliff, Port Phillip, Victoria; coll. E. R. Waite, 1905.

#### Genus CALLOGOBIUS, Bleeker.

*Callogobius*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 318 (*Eleotris hasseltii*, Bleeker). *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 479. *Id.*, McCulloch, Proc. Linn. Soc. N.S. Wales, xl., 1915, p. 271.

*Mucogobius*, McCulloch, Rec. W.Austr. Mus., i., 1912, p. 93 (*Gobius mucosus*, Günther).

Body subcylindrical anteriorly, compressed posteriorly; scales of moderate size, largest posteriorly; they are mostly cycloid, but more or less ctenoid posteriorly; they extend forward almost to the eyes on the upper surface of the head, and cover the breast and base of the pectoral. Head with a few scales on the upper part of the operculum, and others

scattered on the cheek; numerous upraised rows of papillæ are arranged regularly on all surfaces of the head, and along the middle of the sides. Snout obtuse, mandible projecting. Mouth oblique; no barbels. Several rows of small, subequal teeth in each jaw anteriorly; palate toothless. Tongue rounded and free anteriorly, slightly emarginate on the median line. Gill-openings lateral, separated by a broad isthmus; exposed edge of shoulder-girdle smooth. Pseudobranchiaæ present; gill-rakers of first arch short, thick, and few in number. First dorsal rounded, with six spines; second dorsal with ten to eleven rays. Anal similar to the second dorsal. Pectoral large, rounded. Ventrals i/5, either completely united or with only a narrow membrane connecting the bases of the inner rays; anterior interspinous membrane present or absent. Caudal elongate, obtusely pointed.

CALLOGOBIUS HASSELTII, Bleeker.

*Eleotris hasseltii*, Bleeker, Nat. Tijdschr. Ned. Indie, i., 1851, p. 253, and xi., 1856, p. 412. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 116.

*Eleotriodes hasseltii*, Bleeker, Act. Soc. Sc. Indo-Neerl., vi., 1859, p. 112, and Ned. Tijd. Dierk., ii., 1865, p. 150.

*Valenciennesia hasseltii*, Bleeker, Versl. Akad. Amsterdam (2), ii., 1868, p. 300.

*Callogobius hasseltii*, Weber, "Siboga" Exped., lvii., 1913, p. 480, fig. 98, and Nova Guinea, ix., 4, 1913, p. 601.

*Identity.*—Bleeker's description of the species appears to have been incomplete, so we rely upon Weber's notes and figure for the identification of our specimens as *C. hasseltii*. They agree with his illustration in all details, and exhibit the same variation in their colour-marking as noted by him.

We are unable to detect any differences between specimens from tropical waters (*C. hasseltii*) and many others from southern Australian coasts (*C. mucosus*) by which they may be definitely distinguished as two species. Northern examples are usually more conspicuously marked than those from the south, and generally have more of the posterior scales ctenoid. But both characters are variable, and overlap in examples from intermediate localities, so we recognise the southern specimens as a variety of *C. hasseltii* only.

*Locs.*—Masthead Island off Port Curtis, and Cairns Reef off Cooktown, Queensland; coll. McCulloch. Two Isles off Cape Bedford, Queensland; coll. Hedley and Briggs. New Hebrides; coll. Cummins and Stevens.

CALLOGOBIUS HASSELTII, var. MUCOSUS, Günther.

(Plate xxxii., fig. 4.)

*Gobius mucosus*, Günther, Proc. Zool. Soc., 1871, p. 663, pl. lxiii., fig. A. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 609. *Id.*, Waite, Rec. Austr. Mus., vi., 1906, p. 200.

*Gobius depressus*, Ramsay and Ogilby, Proc. Linn. Soc. N.S.Wales (2), i., 1886, p. 4. *Id.*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 35. *Id.*, Waite, Mem. N.S.Wales Nat. Club, ii., 1904, p. 46.

*Mucogobius mucosus*, McCulloch, Rec. W.Austr. Mus., i., 1912, p. 93.

D. vi/11; A. 9; P. 16; V. i/5; C. 16. About 37 scales between the axil and the hypural joint, and 17 between the anterior dorsal and anal rays.

Depth 5·7 in the length to the hypural joint; head 3·9 in the same. Eye slightly shorter than the snout, which is 3·5 in the head. Interorbital space about 4 in the eye. Breadth between the pectoral bases equal to the depth. Depth of the caudal peduncle 2, pectoral 1 in the head.

Head largely naked, with a few scales on the upper portion of the operculum, and one or two very indistinct ones between the mucigerous ridges on the cheeks. All surfaces of the head bear raised lines of papillæ which are regularly arranged and disposed as shown in the accompanying illustration; in addition, series of small pores extend around the eye and preopercular margin. Eyes close together, superolateral, separated by a narrow bony interorbital area. Snout obtuse and rounded. Nostrils tubular. Mouth very oblique, the maxilla not reaching the vertical of the anterior margin of the eye. Mandible projecting beyond the upper jaw; its lower surface with numerous mucigerous ridges. A band of small pointed teeth in each jaw, which is three or four rows wide anteriorly, and becomes gradually narrower laterally; the outer teeth are slightly larger than the others. Palate toothless. Tongue rounded, slightly notched in the middle line, and largely free. The space between the gill-openings is twice as wide as the eye; exposed edge of the shoulder girdle smooth and sharp.

Body subcylindrical anteriorly, compressed posteriorly. It is covered with moderately large cycloid scales, which increase in size backwards, a row along the median line of the caudal half being slightly larger than the others; the scales extend forward on the nape to just behind the eyes, and cover the breast and base of the pectoral fin. Vertical series of mucigerous papillæ extend backward from behind the pectoral to the caudal base, between which some horizontal rows are interspersed. Genital papilla well developed.

First dorsal low and rounded, the fifth spine subequal to the post-orbital portion of the head. Dorsal rays increasing in height to the penultimate, which reaches backward to the upper caudal rays. Anal of similar form to the second dorsal, but shorter and slightly lower. Pectoral large and rounded, not quite reaching the vertical of the vent. Ventrals inserted before the pectoral, completely united, and reaching about two-thirds of their distance from the vent. Caudal elongate, obtusely pointed.

*Colour*.—Brown, each scale with a darker border, and a lighter median band along the middle of the sides posteriorly. Some indefinite broad, darker cross-bands are present on the back and sides; one descends from the base of the spinous dorsal, a second narrower one from the anterior dorsal rays, and a third broad one from the hinder portion of the soft dorsal; two others are present in front of the dorsal fin. The vertical

fins are dark, with some still darker spots on the rays; the anal has a light border. Pectorals and ventrals light coloured, the former with grey spots.

Described and figured from a specimen 85 mm. long from Port Jackson.

*Variation.*—A large number of specimens from Port Jackson, South and South-west Australia, prove this form to be variable in colour; the southern specimens are very dark with their markings obscurely defined, while those from Port Jackson and South-west Australia are often lighter and more or less conspicuously banded. The scales near the caudal fin are generally cycloid, but are sometimes markedly ctenoid; those on the operculum and cheek are often very rudimentary and sometimes wholly wanting. A most critical comparison of these specimens fails to discover any character by which they may be definitely distinguished from the typical *C. hasseltii* of tropical waters.

*Locs.*—We have examined over one hundred specimens from the following localities:—Port Jackson and the neighbouring coast; including the holotype of *Gobius depressus*, Ogilby. Port Phillip, Victoria; coll. C. J. Gabriel. South Australia, various localities. South-western Australia; coll. A. Abjornssen.

*CALLOGOBIUS SCLATERI*, *Steindachner*.

(Plate xxxii., fig. 3.)

*Eleotris sclateri*, Steindachner, Sitzb. Akad. Wiss. Wien, lxxx. i., 1880, p. 157.

*Gobiomorphus sclateri*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 384, fig. 73.

D. vi/10; A. 9; P. 17; V. i/5; C. 15. About 31 rows of scales between the axil and the hypural joint, and about 13 between the anterior dorsal and anal rays.

Depth before the ventrals 4·6 in the length to the hypural joint; head 3·4 in the same. Eye as long as the snout, 4·4 in the head; interorbital space 2·5 in the eye. Depth of the caudal peduncle equal to half the length of the head. Breadth before the pectorals 1·1 in the depth.

Head depressed, broader than deep. The cheeks and opercles are completely covered with large scales, which are usually hidden in thick mucous. The whole head bears upstanding ridges of mucigerous papillæ, which are regularly arranged as illustrated in the accompanying figure. Eyes superolateral, separated by a narrow concave interorbital space. Nostrils close together, tubular, the anterior overhanging the upper lip. Snout depressed, the lower jaw much longer than the upper; mouth oblique, the maxilla not quite reaching the vertical of the orbital margin. An outer series of enlarged conical teeth in the premaxillaries, followed by a narrow band of villiform ones; in the mandible the larger teeth are present anteriorly only, and the villiform ones are somewhat larger on the sides of the jaw. Tongue free and rounded anteriorly. Gill-openings lateral, about as broad as the isthmus separating them. Exposed edge of the shoulder girdle smooth.

Body robust, compressed posteriorly. It is covered with large strongly ctenoid scales, which completely cover the nape, bases of the pectorals, breast and abdomen; they are largest posteriorly, and the hinder ones of the median row on the caudal peduncle are larger than the others. Caudal peduncle very broad and compressed. Genital papilla small.

First dorsal fin originating over the anterior half of the pectoral; the second to fourth rays are subequal in length, and the latter reaches the origin of the second dorsal when adpressed. Dorsal rays increasing slightly in length to the penultimate, which is about as long as the spines. Anal opposite to, and of similar form to the second dorsal, but with a shorter basal length. Pectorals obtusely pointed, the median rays reaching to the vertical of the anterior dorsal ray. Caudal broadly rounded. Ventral fins united at their base by a narrow membrane; the rays increase in length to the fourth, but the fifth is much shorter.

*Colour-marking*.—Light brown in alcohol, with broad darker brown cross-bands; one of these is placed below each dorsal fin and one across the caudal peduncle, and they have numerous irregular dark markings between them. The cross-bands extend onto the dorsal fins where they break up into irregular dark marblings. Pectorals, caudal, and anal with irregular dark cross-bars, the base of the former with two darker stripes.

Described and figured from a specimen 47 mm. long, from Two Isles, North Queensland.

*Variation*.—A series of over one hundred specimens 23-56 mm. long, exhibits some variation in the details of the colour-marking, which is much more pronounced and more variegated in some specimens than in others. The mucigerous system of the head is as well developed in the youngest as in the largest specimens, and the ridges are similarly arranged.

This species has been associated with *Gobiomorphus*, Gill, by Jordan and Seale, but it differs from that genus in the great development of the cephalic mucigerous system. This character distinguishes it from all other genera known to us except *Callogobius*, from the typical species of which it only differs in the structure of its ventral fins. In *C. hasseltii*, these are truly gobioid in form, having a distinct though narrow basal membrane uniting the spines; the fifth rays are slightly shorter than the fourth, but are united by membrane to their tips: in *C. sclateri* the ventrals have no anterior basal membrane connecting the spines; the inner rays are much shorter than the others, and are connected by membrane only at their extreme bases. There being no other major differences between them, it seems probable they are congeneric.

*Loc.*.—We have examined specimens from Two Isles, near Cape Bedford, North Queensland; coll. Hedley and Briggs, August 1916. New Hebrides, Solomon Islands, and Fiji; coll. Cummins and Stevens.

Genus *EXYRIAS*, Jordan & Seale.

*Exyrius*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 405  
(*Gobius puntangoides*, Bleeker).

Body elliptical and compressed, the caudal peduncle short and deep; head deeper than wide, with a short acclivous snout, the cheeks not

swollen. Body covered with large ctenoid scales; cheeks, opercles, and occiput scaly; cheeks with mucigerous canals between the series of scales. Mouth oblique, the jaws equal. Teeth in narrow bands in each jaw; the outer row is enlarged and conical in the premaxillaries, the others villiform; anterior mandibular teeth enlarged, with a short canine on each side. Tongue free and broad, with a feebly emarginate tip. Eyes superolateral and anteromedian, the interspace narrow. Isthmus wide; the exposed edge of the shoulder girdle smooth. Dorsal with about vi, i/10 spines and rays, the spines flexible and more or less produced. Anal with i/9 rays, similar to the second dorsal. Pectoral large and obtusely pointed, without free silk-like rays. Ventrals with i/5 rays. Caudal cuneiform or rounded.

*Exyrias* is very probably identical with *Gnatholepis*, Bleeker, but we retain it on account of the great development of the mucigerous canals of the cheeks, which separate the cheek-scales into three distinct groups. In *Gnatholepis* these canals are scarcely if at all developed, and the squamation of the cheeks is much less definite. In all other characters the two genera are apparently identical.

EXYRIAS PUNTANG, Bleeker.

*Gobius puntang*, Bleeker, Nat. Tijdsch. Ned. Ind., ii., 1851, p. 486. *Id.*, Day, Fish. India, 1876, p. 288, pl. lxii., fig. 1.

*Gobius puntangooides*, Bleeker, Loc. cit., v., 1853, p. 242. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 19, and Fisch. Südsee, v., 1877, p. 171, pl. cviii., fig. a.

*Gobius andamanensis*, Day, Proc. Zool. Soc., 1870, p. 691.

*Gobius maculipinnis*, Macleay, Proc. Linn. Soc. N.S.Wales, viii. 2, 1883, p. 267.

*Gobius concolor*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 689.

*Awuous puntangooides*, Seale, Occ. Pap. Bishop Mus., iv., 1906, p. 84.

*Exyrias puntangooides*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 405.

*Gnatholepis maculipinnis*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 395.

*Exyrias puntang*, Jordan & Richardson, Check-list Fish. Philipp. Arch., 1910, p. 49.

*Gobius (Gnatholepis) puntangooides*, Weber, Abh. Senck. Nat. Ges., xxxiv., 1911, p. 43.

D. vi, i/10; A. i/9; P. 17; V. i/5; C. 17. Twenty-eight series of scales along the middle of the body, and nine between the origins of the soft dorsal and the anal.

Depth of the body 3·7 in its length, and a little less than the length of the head; head 3·6 in the body-length, two-sevenths deeper than wide, its width 1·6 in its length. Eye 4 in the head-length, shorter than the snout, which is 2·6 in the head; interorbital space about half as wide as the eye. Caudal peduncle one-fourth longer than deep, its least depth 6·4 in the body length. Width of the body 1·5 in its depth.

Snout rounded, the profile acclivous. Interorbital region grooved. Jaws equal, the maxillary extending to below the anterior third of the eye. Cheek-scales well developed, about half as large as those of the body; they are arranged in three series consisting respectively of 1, 2, 2 rows, which are separated from one another by two horizontal mucigerous grooves. Scales of the operculum and occiput but little smaller than those of the body. A large median open pore between the anterior borders of the eyes. Jaws with narrow bands of villiform teeth, the outer premaxillary series enlarged and conical: mandible with a moderately strong curved canine at each outer angle, between which the outer series is enlarged; beyond the canines the villiform band extends to the corner of the mouth without enlarged teeth.

Body moderately robust, the dorsal contour evenly rounded from the frontal region to the caudal peduncle, and much more arched than the ventral. Caudal peduncle short and stout. Scales ctenoid; predorsal scales in eleven series, extending forward to between the posterior borders of the pupils.

First dorsal fin originating above the pectoral base, the spines slender and flexible; the second is the longest, reaching well beyond the first ray when adpressed, and one-fifth longer than the head. Margin of the second dorsal straight, the rays gradually increasing in length to the last, which, with the penultimate, is somewhat produced and forms an acute angle which overlaps the caudal-base; its length is one-fourth less than that of the second spine. Anal commencing slightly behind the vertical of the first dorsal ray; the penultimate ray is longest, and a little longer than the basal length of the fin. Pectoral obtusely pointed, the eighth ray longest and extending to below the third dorsal ray, and a little longer than the head. Ventrals inserted below the pectoral-base, and equal in length to five-sixths of its longest ray; it reaches to the vent.

*Colour*.—Bleached after long exposure to the light. According to De Vis, this specimen was brown in colour, with the abdomen paler, and there were traces of narrow vertical bands. The first dorsal had two longitudinal rows of brown spots, and the pectorals and ventrals were dark brown.

The above description is based principally upon the holotype of *Gobius concolor*, De Vis, which is 87 mm. long from the snout to the base of the caudal rays. It is preserved in the Queensland Museum, but is badly mutilated, the soft dorsal, caudal, and anal fins having been broken off short. De Vis described the upper pectoral rays as detached and silky, but this is incorrect.

*Synonymy*.—An example 123 mm. long, labelled as *Gobius puntang*, from the Andaman Islands, which was one of Dr. Day's collection, is preserved in the Australian Museum. Another, the holotype of *G. maculipinnis*, Macleay, is also in the Australian Museum collection, and does not differ from the Indian specimen; Macleay counted seven spines in the first dorsal fin, but there are only six.

We regard *Gobius puntang*, Bleeker and *G. puntangooides*, Bleeker, as synonymous. There are some discrepancies in the various accounts of the two species, but they do not appear to call for much attention. In his

earlier description, Günther states that *G. puntangooides* is without canines and has the eyes close together, while later he recognised small canines and described the eyes as about one diameter apart. Day described and figured the maxillary as reaching to below the middle of the eye, whereas in our specimens, as in those of Bleeker and Günther, it does not extend so far.

*Locs.*—Cape York, Queensland; type of *Gobius concolor*, De Vis. Normanby Island, D'Entrecasteaux Group; type of *G. maculipinnis*, Macleay. Andaman Islands; Dr. Day's collection.

*Distribution.*—From the Andaman Islands, through Malaysia, to North-eastern Australia, the Solomon Islands and the Caroline Islands.

Genus *MUGILOGOBIUS*, *Smitt.*

*Mugilogobius*, Smitt, *Ofv. Ak. Forh.*, 1899, p. 552 (*Ctenogobius abei*, Jordan & Snyder).

Key to the Australian species.

*a.* 41-47 scales between the axil and the hypural.....*devisi*.  
*aa.* 31 scales between the axil and the hypural.....*galwayi*.

*MUGILOGOBIUS DEVISI*, *nom. nov.*

(Plate xxxvi., fig. 2.)

*Gobius stigmaticus*, De Vis, *Proc. Linn. Soc. N.S. Wales*, ix., 1884, p. 686  
 (Not *Smaragdus stigmaticus*, Poey, == *Gobius*<sup>10</sup>).

D. vi/10; A. 9; P. 16; V. i/5; C. 16. 40-47 rows of scales between the axil and the hypural joint, and 13-17 between the anterior dorsal and anal rays<sup>11</sup>.

Depth of the body before the dorsal fin 4·1 in the length to the hypural joint; head 3·3 in the same. Eye 4 in the head, which is subequal to the length of the snout, and 1·09 in the interocular space. Depth of the caudal peduncle 2 in the head, and breadth before the pectoral bases 1·2 in the depth.

Head broader than deep, somewhat depressed. Operculum covered with small scales, cheeks naked. Eyes rather small, superolateral, and separated by a broad slightly concave interspace. Snout obtuse, the jaws subequal. The anterior nostril in a low tube near the upper lip, the posterior close to the orbital margin. Mouth slightly oblique, maxillary reaching backward to beyond the middle of the eye. Premaxillary teeth in a narrow band, the outer row somewhat enlarged and conical; mandibular teeth in a broader band, the posterior row somewhat enlarged. Tongue largely free, subtruncate anteriorly. Gill-opening lateral, somewhat broader than the isthmus; the exposed edge of the shoulder-girdle smooth.

<sup>10</sup> There is some doubt as to whether a new specific name is necessary for this species or not. In substituting the name *devisi* for *stigmaticus* we have been guided by an opinion published by the Malacological Society, which deals with a precisely similar case.—*Proc. Malacol. Soc.*, vi., 3, 1904, p. 130.

<sup>11</sup> The scales are smaller and more irregular in one specimen than in the other.

Body robust, compressed posteriorly. It is covered with ctenoid scales of medium size, which become cycloid on the abdomen and neck, and are larger posteriorly than anteriorly; they extend forward to a short distance behind the eye on the upper surface of the head, and cover the breast and bases of the pectorals. Genital papilla well developed.

First dorsal originating above the middle of the pectoral; the spines increase slightly in length to the fourth, which is shorter than the post-orbital portion of the head, and the membrane from the last is widely separated from the second dorsal. The rays appear to be subequal, and a little higher than the longest spine. Anal opposite to the dorsal, and of similar form, its rays increasing in length backwards. Pectorals rounded, the median rays reaching to below the last dorsal spine; no free upper rays. Ventrals inserted a little before the pectorals, and somewhat shorter than those fins. Caudal broadly rounded.

*Colour-marking.*—Yellowish brown in alcohol, the scales of the upper portions with darker borders; a series of dark brown blotches along the middle of the sides on the posterior half, and an alternating series between these and the back. Head with four curved dark stripes radiating from the eye; one descends towards the angle of the mouth, two others cross the cheek, and are united by a curved bar with another which crosses the nape. First dorsal dusky, with a broad white border, and the posterior portion black. Second dorsal with dark specks on the membrane between the rays, which form a row of darker spots along the middle of the fin; a broad white border. Anal lighter, the margin clear. Caudal, pectoral, and ventral fins with microscopic dark dots between the rays.

Described from a specimen 45 mm. long, which is one of two cotypes preserved in the Australian Museum, and which were procured from Mr. De Vis. They differ from the original description in the numbers of fin-rays and scales, but agree so well with the colour description and other characters, that there can be no doubt as to their authenticity.

This species is closely allied to the genotype, *M. abei*, Jordan and Snyder<sup>12</sup>.

*Loc.*—Moreton Bay, Queensland.

*MUGILOGOBius GALWAYI*, McCulloch & Waite.

*Mugilogobius galwayi*, McCulloch & Waite, Rec. S. Austr. Mus., i. 1, 1918, p. 50, pl. iii., fig. 1.

*Hab.*—South Australia.

(*GOBIUS*) *FLAVESCENS*, De Vis.

(Plate xxxvi., fig. 3.)

*Gobius flarescens*, De Vis, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 689.

D. vi/8; A. 8; P. 16; V. i/5; C. 15. 27 scales between the axil and the hypural joint, and 8 between the anterior dorsal and anal rays.

Depth of the body before the ventrals 5·3 in the length to the hypural joint; head 3·7 in the same. Eye much longer than the snout, and 3·1 in

<sup>12</sup> Jordan & Snyder—Proc. U.S. Nat. Mus., xxiv., 1901, p. 55, fig. 5.

the head. Interocular width 1·2 in the eye. Interorbital width 2·2 in the eye, and 1·5 in the snout, which is 4·6 in the head. Depth of the caudal peduncle 1·7 in the head. Breadth before the pectoral fin 1·1 in the depth.

Head as broad as deep, with a very obtuse snout. The cheeks are naked, but the opercles are covered with about eight large concentrically striated scales. Some microscopic papillæ near the mouth and below the lower border of the preoperculum. Eye large, in the anterior half of the head, and superolateral; the interorbital space is narrow, but the distance between the ocular margins is wider. Snout tumid, its profile oblique; jaws subequal. Nostrils separate, in minute tubes, the anterior near the upper lip, the posterior near the eye. Maxilla reaching to below the anterior portion of the eye. An outer row of flattened movable teeth in each jaw, and there are some microscopic inner teeth on the anterior portion of the mandible; inner premaxillary teeth not apparent: a slightly enlarged tooth on each side of the mandibular symphysis. Tongue thick, and largely adnate to the floor of the mouth, its anterior margin subtruncate. Gill-openings lateral; the exposed edge of the shoulder-girdle smooth.

Body compressed, with a broad and rather long peduncle. Scales large and angular, and ctenoid on the body, but cycloid on the nape and neck. They extend forward to between the posterior portions of the eyes; there are seven predorsal scales, which increase in size forwards. Base of the pectoral and breast scaly. Genital papilla developed.

First dorsal originating above the anterior half of the pectoral; the second spine is slightly longer than those on either side of it, and the others decrease regularly backwards. Third dorsal ray highest, and longer than the second spine; the following rays decrease in length backwards. Anal opposite the dorsal, but with a rather shorter base; its rays are subequal in length. Pectoral rounded, the middle rays reaching the tenth row of scales. Ventrals inserted before the pectorals, and but little shorter than those fins; the basal membrane is broad. Caudal rounded.

*Colour-marking.*—Faded after long preservation in alcohol, but light in colour. Each scale of the upper portions with a broad submarginal border of dark dots. Head and middle of the sides freckled with clusters of dark dots, which are also present on the dorsal fins.

Described and figured from one of two cotypes 32 mm. long, which are preserved in the Australian Museum. These were secured from Mr. De Vis in 1886 by one of us (Ogilby), and are labelled as *Gobius flavesiensis*, from Moreton Bay. They differ from the original description in several important details: there are nine rays in the second dorsal and anal fins instead of eleven and ten as described; the proportions of the head and depth of the body are very different from those given by De Vis; the interorbital space is much narrower than the orbit, though it should be noted that the eye is subequal to the interocular width. On the other hand they agree with the description in their colour-marking, physiognomy, and in having large scales on the nape, while the tail and other parts are covered with thick mucous. Taking into consideration the history of the specimens, and making allowance for the extraordinary inaccuracies common to De Vis's descriptions, we regard them as true cotypes of *G. flavesiensis*.

*Loc.*—Moreton Bay, Queensland.

(GOBUS) AUSTRALIS, *Ogilby*.

(Fig. 5.)

*Gilliehthys australis*, *Ogilby*, Proc. Linn. Soc. N.S.Wales (2), ix., 1894, p. 367.

*Gobius australis*, *McCulloch*, Rec. Austr. Mus., xi. 7, 1917, p. 187, pl. xxxi., fig. 3.

*Variation*.—Only the largest examples of this species have the maxilla produced backward towards the preoperculum as described by *Ogilby* and figured by *McCulloch*. A fine series of over one hundred specimens, 18-41 mm. long, which were taken together in Port Jackson, shows that the mouth is always small in young specimens, reaching only a little beyond the vertical of the anterior border of the eye; this last decreases in size considerably with growth, and in the largest specimens of the series, the maxilla extends to below its posterior third. In a 45 mm. specimen, the end of the maxilla is a little behind the vertical of the posterior orbital border, and in one of 58 mm., it is midway between the eye and the preopercular margin.

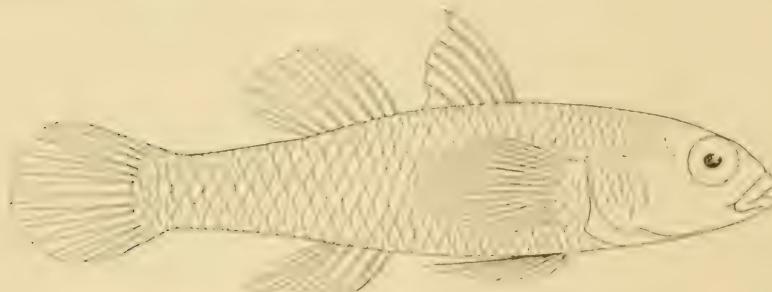


Fig. 5. (*Gobius*) *australis*. A young specimen 29 mm. long, from Port Jackson.

The body is more slender in the young, but the characteristic colour-marking is well developed in even the smallest specimens of our series.

*Locs*.—Many specimens, including the holotype, are in the Australian Museum from several localities between Newcastle and Jervis Bay, New South Wales.

(GOBUS) MICROPHTHALMUS, *Günther*.

*Gobius macrostoma*, *Günther*, Brit. Mus. Cat. Fish., iii., 1861, p. 44 (not of *Steindachner*).

*Gobius microphthalmus*, *Günther*, *Ibid.*, p. 550.—Substitute name.

This species appears to be closely allied to the preceding.

*Hab*.—Australia (*Günther*).

Genus *Awaous*, *Steindachner*.

*Awaous* (Steindachner), Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 405.

AWAOUS CRASSILABRIS, *Günther*.

*Gobius crassilabris*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 63. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 61, and Fische Südsee, vi., 1877, p. 178, pl. cviii., fig. b.

This species has been recorded from Australia by Günther. An example is in the Australian Museum from Townsville, Queensland.

Genus *Gobius*, *Linnaeus*.GOBIUS ORNATUS, *Rüppell*.

(Plate xxxiii., fig. 2.)

*Gobius ornatus*, Rüppell, Atlas Reise Nordl. Afrika, Fische, 1828, p. 135. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 21, and Ann. Mag. Nat. Hist. (3), xx., 1867, p. 61. *Id.*, Kner, Reise "Novara," Zool., i., 1865, p. 173. *Id.*, Steindachner, Sitzb. Akad. Wiss. Wien, lvi. i., 1867, p. 312. *Id.*, Day, Fish. India, 1876, p. 294, pl. lxiii., fig. 1. *Id.*, Günther, Fische Südsee, vi., 1877, p. 172, pl. cxi., fig. a. *Id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 331. *Id.*, Günther, Voy. "Challenger," Zool., i. 6, 1880, p. 44. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 356, and v., 1881, p. 594. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 382. *Id.*, Regan, Ann. Mag. Nat. Hist. (7), xviii., 1906, p. 453.

*Gobius ventralis* (Ehrenberg), Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 113.

*Gobius interstinctus*, Richardson, Ichth. "Erebus & Terror," 1844, p. 3, pl. v., figs. 3-6.

*Gobius periophthalmodoides*, Bleeker, Nat. Tijd. Ned. Ind., i., 1851, p. 249.

D. 6/11; A. 10; P. 19; V. 1/5; C. 13. Scales in 29 rows between the operculum and the hypural joint, and in 9 between the anterior dorsal and anal rays. Depth 5 in the length to the hypural joint; head 3·6 in the same. Eye 4 in the head; interorbital width 4·5 in the eye. Snout longer than the eye, 3·2 in the head; depth of caudal peduncle 2·1 in the same.

Cheeks and opercles naked, with minute mucusiferous canals and the usual preopercular, nuchal, occipital and rostral pores. Eyes of moderate size, breaking the profile, and separated by a very narrow interorbital space. Snout a little longer than the eye, its profile oblique and convex. Anterior nostril in a short tube, the posterior a simple opening. Maxillary reaching to below the middle of the eye, mandible shorter than the premaxillaries. A band of villiform teeth in each jaw; a few enlarged, cardiform, curved teeth in the front of the upper jaw, and some smaller ones in the lower; palate and tongue toothless. Tongue rounded anteriorly.

Body subcylindrical anteriorly, compressed posteriorly. It is covered with large, finely etenoid scales, which extend forward to behind the eyes, and onto the thorax and the base of the pectoral. Most of the scales of the median lateral row each bear a vertical series of mucigerous pores. Genital papilla well developed.

First dorsal rounded, originating well behind the pectorals; the second ray is longest, about as long as the head without the operculum. The rays of the second dorsal increase slightly in length backward to the penultimate. Anal originating behind the second dorsal and terminating a little in advance of it; the two fins are of similar form, but the posterior anal rays are a little longer than those of the dorsal, and slightly longer than the second dorsal spine. Pectoral rounded, reaching to below the first dorsal ray; the four upper rays are silk-like, bifurcate, and free from the membrane. Ventrals inserted behind the pectorals but before the dorsal, and reaching to the anal. Caudal rounded.

*Colour.*—Light brown in alcohol, with rows of large black spots on the sides; on the nape and back, these spots are smaller and linear, and form about five rows anteriorly; a series of large blotches along the middle of the sides, and another of smaller blotches below it. Obscure darker saddles cross the back, and pearly spots are present on most of the scales. Cheeks and opercles with dark blotches, and two more cross the pectoral base. Dorsal fins with rows of dark brown spots and intermediate light pearly lines, their margins yellowish. Caudal dark spotted, with pearly lines and spots between the rays; pectoral similar, but with the dark spots less evident. Anal with about four rows of dark lines basally between the rays; these are followed by large transparent spots, after which the fin is again dark with a lighter margin. Ventrals blackish.

Described and figured from a specimen 84 mm. long, collected at Murray Island, Torres Strait. A fine series of over one hundred specimens 25-95 mm. long, and mostly from the same locality, shows that this species varies but little in the general arrangement of its colour marking. Younger examples are lighter, and have fewer and larger spots than the adults, and the pectorals are usually without darker spots.

*Locs.*—Specimens are in the Australian Museum from the following localities:—Murray Island, Torres Strait; Two Isles, near Cape Bedford, North Queensland; Cairns Reef, off Cooktown, Queensland; Port Darwin, North Australia; New Hebrides.

*Distribution.*—This species ranges from the Red Sea through the East Indies, to the Eastern Pacific. It is recorded from North-western Australia southwards to the King River (Regan), Port Darwin, and North-eastern Queensland southward to Cooktown.

The affinities of the following sixteen species are unknown to us.

(*Gobius*) *PAUPER*, *De Vis.*

*Gobius pauper*, *De Vis*, *Proc. Linn. Soc. N.S.Wales*, ix., 1884, p. 687.

*Loc.*—Moreton Bay, Queensland (*De Vis*).

(GOBIUS) PRINCEPS, *De Vis.**Gobius princeps*, *De Vis*, *Loc. cit.*, p. 685.*Loc.*—Cape York, Queensland (*De Vis*).(GOBIUS) WATKINSONI, *De Vis.**Gobius watkinsoni*, *De Vis*, *Loc. cit.*, p. 685.*Loc.*—Moreton Bay, Queensland (*De Vis*).(GOBIUS) TAMARENSIS, *Johnston.**Gobius tamarensis*, *Johnston*, *Proc. Roy. Soc. Tasm.*, 1882 (1883), p. 120.Said to resemble *Gobius lateralis*, *Macleay*.*Loc.*—Tamar River, Tasmania, in fresh water (*Johnston*).(GOBIUS) HAACKEI, *Steindachner.**Gobius haackei*, *Steindachner*, *Sitzb. Akad. Wiss. Wien*, lxxxviii. i., 1884, p. 1074.*Hab.*—South Australia (*Steindachner*).(GOBIUS) PULCELLUS, *Castelnau.**Gobius pulchellus*, *Castelnau*, *Proc. Zool. Soc. Vict.*, i., 1872, p. 125.*Loc.*—Western Port, Victoria (*Castelnau*).(GOBIUS) FILAMENTOSUS, *Castelnau.**Gobius filamentosus*, *Castelnau*, *Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.)*, 1875, p. 19.*Loc.*—Adelaide, South Australia (*Castelnau*).(GOBIUS) MACULATUS, *Castelnau.**Gobius maculatus*, *Castelnau*, *Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.)*, 1875, p. 20.*Hab.*—Queensland (*Castelnau*).(GOBIUS) CASTELNAUI, *Macleay.**Gobius frenatus*, *Castelnau*, *Proc. Zool. Soc. Vict.*, i., 1872, p. 123 (not of *Günther*).*Gobius castelnau*, *Macleay*, *Proc. Linn. Soc. N.S.Wales*, v., 1881, p. 598.*Loc.*—Hobson's Bay, Victoria (*Castelnau*).

(GOBIUS) FRENATUS, *Günther*.*Gobius frenatus*, *Günther*, Brit. Mus. Cat. Fish., iii., 1861, p. 39.*Hab.*—Australia (*Günther*).(GOBIUS) NIGROCELLATUS, *Günther*.*Gobius nigrocellatus*, *Günther*, Journ. Mus. Godeff., i. 2, 1874, p. 101.*Loc.*—Bowen, Queensland (*Günther*).(GOBIUS) PLATYSTOMA, *Günther*.*Gobius platystoma*, *Günther*, Proc. Zool. Soc., 1871, p. 664, pl. lxiii., fig. b.*Loc.*—Port Mackay, Queensland (*Günther*).(GOBIUS) VOIGTII, *Bleeker*.*Gobius voigtii*, *Bleeker*, Nat. Tijdschr. Ned. Ind., vii., 1854, p. 83. *Id.*, *Günther*, Brit. Mus. Cat. Fish., iii., 1861, p. 72, and Ann. Mag. Nat. Hist. (3), xx., 1867, p. 61.*Loc.*—Port Essington and Cape York (*Günther*).(GOBIUS) SUPPOSITUS, *Sauvage*.*Gobius suppositus*, *Sauvage*, Bull. Soc. Philom. (7), iv., 1880, p. 41.*Loc.*—Swan River (*Sauvage*).GOBIUS INFESTUS, *Sauvage*.*Gobius infestus*, *Sauvage*, Bull. Soc. Philom. (7), iv., 1880, p. 42.*Loc.*—Melbourne (*Sauvage*).(GOBIUS) OLORUM, *Sauvage*.*Gobius olorum*, *Sauvage*, Bull. Soc. Philom. (7), iv., 1880, p. 43.*Loc.*—Swan River (*Sauvage*).MAPO, *Smitt*.*Mapo*, *Smitt*, Afh. Vet. Kong. Ak. Stockholm, 1899, p. 543 (*Gobius soporator*, *Cuvier & Valenciennes*).

This genus only differs from *Gobius* in having the tongue notched on the median line anteriorly instead of being truncate.

α.	Anal with nine rays	.....	.....	<i>fusca</i> .
αα.	Anal with ten rays	.....	.....	<i>krefftii</i> .

## MAPO FUSCUS, Rüppell.

(Plate xxxiii., fig. 3.)

*Gobius fuscus*, Rüppell, Atl. Reise Nordl. Afrika, Fische, 1828, p. 137.*Gobius punctillatus*, Rüppell, Loc. cit., 1828, p. 138.*? Gobius soporator*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 56. *Id.*, Jordan & Evermann, Bull. U.S. Nat. Mus., xlvi. iii., 1898, p. 2216 (*ubi* synonym).*Gobius albopunctatus*, Cuvier & Valenciennes, Loc. cit., p. 57. *Id.*, Rüppell, Neue Wirbelth., Fische, 1838, p. 138. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 25, and Fische Südsee, vi., 1877, p. 172, pl. ex., fig. a. *Id.*, Day, Fish. India, 1876, p. 294, pl. lxiii., fig. 7. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 357, and Loc. cit., v., 1881, p. 595.*Gobius nebulopunctatus*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 57. *Id.*, Rüppell, Neue Wirbelth., Fische, 1838, pp. 138, 139. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 26. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 382. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 31.*Gobius pandangensis*, Bleeker, Nat. Tijd. Ned. Ind., i., 1849, p. 249.*Gobius breviceps*, Blyth, Proc. Asiat. Soc. Bengal, 1858, p. 271.*Gobius homocyanus*, Vaillant & Sauvage, Revue Mag. Zool. (3), iii., 1875, p. 280.*Gobius darnleyensis*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 331, pl. xii., fig. 1.*Gobius nigripinnis*, Alleyne & Macleay, Ibid., p. 332, pl. xii., fig. 2.*Gobius sandvicensis*, Günther, "Challenger" Rept., Zool., i., 1880, p. 60.*Gobius marginalis*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 686.*? Gobius poecilichthys*, Jordan & Snyder, Proc. U.S. Nat. Mus., xxiv., 1901, p. 52, fig. 4.*Mapo fuscus*, Jordan & Evermann, Bull. U.S. Fish. Bureau, xxiii. i., 1905, p. 483, fig. 212. *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 466.

D. vi/10-11; A. 9; P. 18; V. i/5; C. 15. Thirty-six rows of scales between the upper base of the pectoral and the hypural joint, and thirteen to fourteen between the anterior dorsal and anal rays.

Depth 4·2 in the length to the hypural joint; head 3·3 in the same. Breadth between the bases of the pectorals 1·1 in the depth. Eye equal to the snout, 4 in the head; interocular space 2·5 in the eye. Depth of the caudal peduncle 2·2, and caudal fin 1·05 in the head. Fifth dorsal spine 2·2, posterior dorsal and anal rays 1·4 in the head.

Head naked with swollen cheeks. Very fine rows of mucigerous pores cross the cheeks and opercles, and one extends from behind the preopercular margin onto the mandible; open pores are present on the snout, interorbital space, behind the eye and the preoperculum, and above the operculum. Eyes close together, cutting the profile. Snout declivous; anterior nostril tubular, the posterior a simple opening before the eye. Mouth a little oblique, with thick fleshy lips, the maxilla reaching

to below the middle of the eye; jaws equal. An outer row of enlarged stout teeth in the premaxillaries, followed by a band of smaller ones which is broadest anteriorly but narrows laterally; a broader patch on the anterior half of the mandible, the outer teeth being largest, though there are a few enlarged ones about the middle of the sides; they form a single row on the sides. Tongue broad and notched anteriorly, only the tip free. Gill openings wider than the interspace separating them; exposed edge of the shoulder-girdle smooth.

Body compressed, covered with rather large ctenoid scales, which extend forward almost to the eyes on the nape, and cover the breast; they are rudimentary on the base of the pectoral. They increase in size towards the tail, and each scale of the median row has a vertical series of mucigerous pores on the hinder half of the body. Genital papilla large.

First dorsal commencing well behind the base of the pectoral; the five anterior spines are subequal in length, and the membrane from the last almost touches the base of the first ray. Dorsal rays increasing slightly in length backwards, the last forming a pointed lobe which overlaps the base of the caudal fin. Anal similar to the second dorsal. Pectoral rounded, reaching the vertical of the anterior dorsal rays; the three upper rays are bifid and filamentous, silk-like. Ventrals inserted below the pectoral base, large and completely united, not quite reaching the vent. Caudal broadly rounded.

*Colour-marking*.—Back light-coloured, with six broad dark saddle-shaped cross-bands which expand and become confluent on the sides. The first crosses the nape, the second is largely anterior to the dorsal fin, the third is behind the fifth spine, the fourth behind the third ray, the fifth behind the third last ray, and the sixth near the base of the tail. Below the middle of the sides they form dark blotches which are largely alternate to those of the back. Most of the scales, particularly of the lower lateral portions, bear a round light ocellus. Cheeks and base of pectoral with numerous light spots; a dark spot behind the eye. First dorsal dusky, with darker markings, and a broad whitish border. Second dorsal dusky with lighter and darker spots on the rays, and a narrow blackish margin. Caudal with dark spots on the rays on the upper half, its lower portions and the anal somewhat dusky. Ventrals blackish, pectorals dusky.

Described and figured from a specimen 86 mm. long, from Darnley Island, Torres Strait; the details of the light spots of the head and body are supplemented from those of another example. It appears to be quite similar to an Indian example identified by Dr. Day as *G. albo punctatus*.

*Variation*.—The light spots which, when present, form such a striking feature of this species, appear to be developed only in larger examples, and are often lost in preservation; they are rarely retained in examples preserved in formalin, but some in alcohol exhibit them very clearly. The dark saddle-like cross-bands and the lateral blotches are usually much more pronounced in young examples than in adults, and they appear as illustrated in the figure of *M. poccilichthys*, Jordan & Snyder.

*Nomenclature*.—*Gobius fuscus*, 1828, was a “provisional” name for a single specimen from the Red Sea, briefly characterised by Rüppell; in 1838, this holotype was identified by its author as *G. nebulopunctatus*, Cuvier & Valenciennes, 1837, and further details of its characters were published. In 1861, Günther (Cat. p. 25) again examined this specimen<sup>13</sup> in the Senckenberg Museum, and identified it as *G. albopunctatus*, Cuvier & Valenciennes, 1837. *G. albopunctatus* and *G. nebulopunctatus* are now generally considered identical, and as *G. fuscus* has been identified with each, and having priority, it is the proper name to be used for this species.

*Synonymy*.—Four examples in the Macleay collection bear the original label “*G. darnleyensis*, Alleyne & Macleay, Darnley Is.” They differ from the description of that species in their proportions, but agree with the figure, and the anal rays are not longer than those of the dorsal. They are doubtless the cotypes of *G. darnleyensis*, and agree in all details with an Indian example identified by Dr. Day as *G. albopunctatus*.

Two adults and four young specimens labelled as “*Gobius nigripinnis*, Alleyne & Macleay, Palm Islands”, are in very bad condition, having been partly dried and decayed. They have ten instead of eleven rays in the second dorsal, and the interorbital space is less than half the diameter of the eye instead of equal to it. They are the cotypes of the species, and notwithstanding their imperfect condition, are clearly identical with *G. darnleyensis*.

Five cotypes of *G. marginalis*, De Vis, from Cape York, agree perfectly with those of *G. darnleyensis*.

We consider *M. poecilichthys*, Jordan & Snyder, to be merely the young form of *M. fuscus*, since we have Queensland examples which agree well with the illustration of the Japanese species, and which are connected with the adult form of *G. fuscus* as we figure it, through an intermediate series.

*M. aeolosoma*, Ogilby<sup>14</sup>, is very similar to and possibly identical with *M. fuscus*, differing only in its somewhat different colour-marking. Waite's figure<sup>15</sup> illustrates the characteristic pattern of numerous specimens from Lord Howe Island, having the saddle-markings somewhat less definite than in *M. fuscus*, and a row of dark blotches along the middle of the sides, below which are some dark lines. This marking is variable however, and is sometimes not distinguishable from that of *M. fuscus*.

*Locs*.—Murray Island, Torres Strait; coll. Hedley and McCulloch. Darnley Island, Torres Strait; cotypes of *G. darnleyensis*. Cape York, Queensland; cotypes of *G. marginalis*. Palm Islands, Queensland; cotypes of *G. nigripinnis*. Various localities between Cooktown and Port Curtis, Queensland; coll. McCulloch. Sweers Island, Gulf of Carpentaria; coll. C. Hedley. Port Darwin, Northern Territory; Macleay Museum.

<sup>13</sup> Günther (Cat., p. 26) stated that the type of *G. fuscus* was lost, but records that he examined Rüppell's “typical” example of *G. nebulopunctatus* (*Ibid.*, p. 25). Since the same specimen served for both of Rüppell's identifications, it seems probable that the example seen by Günther was really the holotype of *G. fuscus* bearing the changed name of *G. nebulopunctatus*.

<sup>14</sup> Ogilby—Mem. Austr. Mus., ii., 1889, p. 61.

<sup>15</sup> Waite—Rec. Austr. Mus., v., 1904, p. 176, pl. xxiii., fig. 2.

*Distribution.*—This species ranges from the Red Sea and the Eastern Coast of Africa to Japan, Australia, and the Eastern Pacific Ocean.

If *G. soporator* be correctly identified with it, as seems probable, its range also extends to both coasts of America.

MAPO KREFFTII, *Steindachner.*

(Plate xxxiii., fig. 4.)

*Gobius krefftii*, Steindachner, Sitzb. Akad. Wiss. Wien., liii. i., 1866, p. 451.

*Gobius criniger*, Steindachner, Loc. cit., lvi. i., 1867, p. 326 (not of Cuvier and Valenciennes).

*Gobius brevifilis*, Günther, "Challenger" Rept., Zool., i., 1880, p. 28. *Id.*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 35. *Id.*, Waite, Mem. N.S.Wales Nat. Club, ii., 1904, p. 45 (not *G. brevifilis*, Day).

*Gobius buccatus*, Macleay, *Ibid.*, p. 601. *Id.*, Ogilby, *Ibid.* *Id.*, Waite, *Ibid* (not of Cuvier and Valenciennes).

*Gobius flavidus*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 602. *Id.*, Ogilby, *Ibid.* *Id.*, Waite, *Ibid.*

D. vi/11; A. 10; P. 16-17; V. i/5; C. 14. 36-37 rows of scales between the upper base of the pectoral and the hypural joint, and 13-14 between the anterior dorsal and anal rays.

Depth 4·8 in the length to the hypural joint; head 3·4 in the same. Breadth between the bases of the pectorals 1·05 in the depth. Eye slightly shorter than the snout, 4·1 in the head. Interocular space 6 in the eye. Depth of the caudal peduncle 2·3, and the caudal fin 1·1 in the head. First dorsal spine 2, third dorsal ray and penultimate anal ray nearly 2 in the head.

*Colour-marking.*—Body greenish white on the back and white below with six saddle markings composed of reddish brown spots and disposed as in *M. fuscus*. Eight or nine darker blotches are present along the middle of the sides. Head mottled and dotted with reddish brown spots which are largest on the cheeks and opercles. Dorsal fins with several rows of brownish pink spots, their margins yellowish. Caudal with similar spots; the rest of the fin and the pectorals, anal, and ventrals pale yellow.

*Variation.*—The intensity of the colour-marking varies greatly in different specimens, though it is similarly disposed in all, and the relative lengths of the dorsal and anal spines and rays vary with growth.

This species is similar in all structural details to *M. fuscus*, and greatly resembles that species in its colour-marking also, though it apparently does not develop any light ocelli on the scales. It is characterised however, by having ten instead of nine anal rays, as we find by counting a large number of specimens of both species.

*Synonymy.*—Soon after the description of *G. krefftii*, Steindachner, was published, its author indicated, with much doubt, the identity of his

species and *G. criniger*. This error was unfortunately accepted, and the name *G. krefftii* has been omitted from all later lists, the species being incorrectly referred to as *G. brevifilis*, which is synonymous with *G. criniger*.

The specimens identified as *G. buccatus*, Cuvier and Valenciennes, from Port Jackson by Macleay, differ from the description of that species in having fewer rays in the dorsal and anal fins and in having a very narrow instead of a wide interorbital space. They do not differ from our examples of *M. krefftii*.

The two cotypes of *G. flavidus*, Macleay, 31-37 mm. long, are very faded, but are quite similar in all details to our *M. krefftii*.

*Locs.*—This species is common near Sydney, and we have examined numerous specimens from several localities between Port Stephens and Jervis Bay, New South Wales. The example figured is from Port Jackson.

#### GLOSSOGOBius, Gill.

*Glossogobius*, Gill, Ann. Lyc. Nat. Hist. N.York, 1859, p. 46 (*Gobius platycephalus*, Richardson).

*Cephalogobius*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, pp. 315, 320.

Body covered with rather large ctenoid scales, about 33 in a longitudinal row; head almost naked, depressed anteriorly, with lines of mucigerous pores on the cheeks. Lower jaw projecting. Teeth in several rows, the outer enlarged, fixed and subulate, the inner depressible; palate toothless. Tongue deeply notched anteriorly. Isthmus narrow, the gill-membranes close together or completely united across it; shoulder-girdle smooth. Pseudobranchiaæ present. Ventral fins united, with one spine and five rays. Dorsal with six spines and about ten rays, anal with about nine.

- a. Gill membranes separated by the isthmus. About 33 scales between the upper base of the pectoral and the hypural joint; maxilla reaching to below the middle of the eye. Lower portion of tail without broad blackish bars.....*giuris*.
- aa. Gill membranes meeting across the isthmus. About 30 scales between the upper base of the pectoral and the hypural joint; maxilla reaching to below the hinder portion of the eye. Lower half of tail with broad blackish bars.....*biocellatus*.

*Gobius circumspectus*, Macleay (Proc. Linn. Soc. N.S.Wales, viii., 1883, p. 267) from Milne Bay, Papua, is a species of *Glossogobius*, and is very similar to *G. giuris*. The holotype is 115 mm. long. Depth 5·1 in the length from the premaxillary symphysis to the hypural joint; head, without mandible, 3·1 in the same. D. vi/10; A. 9. Thirty-one scales between the upper base of the pectoral and the hypural joint, and  $\frac{1}{2}$  9  $\frac{1}{2}$  between the anterior dorsal and anal rays. Second dorsal spine filamentous; dorsal rays increasing in length backward, the last reaching about three-quarters of its distance from the caudal. The colour-markings are similar to those of *G. giuris*.

*Gobius concavifrons*, Ramsay and Ogilby (Proc. Linn. Soc. N.S.Wales (2), i., 1887, p. 12) is also a *Glossogobius*, and possibly identical with *G. celebius*, Cuvier and Valenciennes.

## GLOSSOGOBius GIURIS, Buchanan.

*Gobius giuris*, Buchanan, Fish. Ganges, 1822, pp. 51, 366, pl. xxxiii., fig.

15. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 21. *Id.*, Day, Fish. India, 1876, p. 294, pl. lxvii., fig. 1 (*vide* synonymy). *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 356.

*Gobius fasciato-punctatus*, Richardson, Voy. "Sulphur," Ichth., 1845, p. 145, pl. lxii., figs. 13, 14.

*Glossogobius giuris*, Weber, "Siboga" Exped., lvii., 1913, p. 468, fig. 93.

*Gobius sauroides*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1878, p. 48.

*Eleotris laticeps*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 692.

D. vi/10; A. 9; P. 21; V. i/5; C. 13. 34 rows of scales between the upper base of the pectoral and the hypural joint, and 11 between the anterior dorsal and anal rays.

Depth 5·8 in the length between the premaxillary symphysis and the hypural joint; head, without the mandible, about 3 in the same. Eye 6 in the head, and 1·8 in the snout, which is 3·3 in the head. Interorbital space 1·8 in the eye. Depth of the caudal peduncle 3·3 in the head; breadth between the pectoral bases subequal to the depth. Second dorsal spine 2·2, first dorsal ray about 2, third anal ray 2·7, and caudal 1·3 in the head.

Head naked, with the exception of a few small scales on the upper portion of the operculum. About five rows of minute pores cross the cheek horizontally, and others extend around the eye and preopercular margin, and on the operculum, snout and mandible; an open pore between the eyes, and others behind the preopercular margin. Eyes of moderate size, superolateral, and separated by a flat interorbital space. Snout long, obtusely pointed, the mandible much longer than the upper jaw; maxillary reaching to below the middle of the eye. Nostrils close together, the anterior in a short tube, the posterior a simple opening slightly nearer the eye than the end of the snout. Premaxillary teeth in two series, the outer formed of a row of fixed subulate teeth, and the inner of a band of depressible teeth, the innermost of which are much longer than the others and acicular; mandibular teeth similar. Tongue largely free, its anterior margin deeply notched. Free edges of the gill-membranes separated by a space about half as wide as the eye; exposed margin of the shoulder-girdle smooth, without papilla.

Body subcylindrical anteriorly, compressed posteriorly, and covered with rather large, angular, etenoid scales, which are largest posteriorly. They extend forward to a little behind the eyes on the nape, and onto the breast and base of the pectoral. A small genital papilla.

First dorsal commencing a little before the middle of the pectorals; the second spine is longest, the others decreasing backwards; dorsal rays decreasing in length backwards, the last reaching about half its distance from the caudal. Anal nearly opposite the soft dorsal, the rays increasing in height backwards. Pectoral narrowly rounded, the median rays almost reaching the vertical of the vent. Ventrals completely united, inserted behind the pectorals, and reaching about three-quarters of their distance from the vent. Caudal rounded.

*Colour-marking*.—Whitish in formaline, mottled with olive-green script-like markings on the head and upper half of the body; four larger dark blotches along the sides, and a blackish spot at the base of the tail. Operculum with a dark blotch. Dorsal and caudal fins with rows of greyish spots on the rays; base of the pectoral with a dark bar on its upper portion.

Described from a specimen 127 mm. long, from the Flinders River, Queensland, which is quite similar to an Indian example received from Dr. Francis Day.

*Synonymy*.—*Gobius sauroides*, Castelnau, was described from a specimen seven inches long, which was taken in the Norman River, Gulf of Carpentaria. We have an example rather less than five inches long from the same locality, which agrees with Castelnau's description in most details, though it has fewer scales and more numerous dorsal rays. It is identical with *G. giuris*, and indicates that *G. sauroides* is synonymous with that species.

The holotype of *Eleotris laticeps*, De Vis, is preserved in the Queensland Museum. It has been stuffed and is now very imperfect, the fins being much broken, while no trace of its colour-marking remains. It is clearly identical with *G. giuris*, however, even a portion of the membrane uniting the ventrals being preserved between the bases of the fins.

*Locs*.—Flinders River, near Richmond, Queensland; coll. F. L. Berney. Norman River, Gulf of Carpentaria; coll. Dr. C. Taylor. Port Darwin, Northern Australia; Macleay Museum.

#### GLOSSOGOBius BIOCCELLATUS, Cuvier and Valenciennes.

*Gobius biocellatus*, Cuvier and Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 73. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 20. *Id.*, Day, Fish. India, 1876, p. 289, pl. lixiii., fig. 8.

*Gobius (Glossogobius) biocellatus*, Weber, "Siboga" Exped., lvii., 1913, p. 470. *Glossogobius vaisiganis*, Jordan and Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 403, fig. 93.

D. vi/10; A. 9; P. 17; V. i/5; C. 13. 29 rows of scales between the upper base of the pectoral and the hypural joint; 9 between the anterior dorsal and anal rays.

Depth 6·5 in the length between the premaxillary symphysis and the hypural joint; head, without mandible, 3·1 in the same. Eye 4·6 in the head, and 1·2 in the snout, which is 4 in the head. Interorbital space 4·2 in the eye. Depth of caudal peduncle 3·5 in the head; breadth between the bases of the pectorals slightly greater than the depth. Second dorsal spine 2·1, second dorsal ray 1·7, penultimate anal ray 1·6, and caudal 1·3 in the head.

Head wholly naked, mucigerous system not well defined. Eyes superior, separated by a very narrow interspace. Snout long, pointed, the mandible much longer than the upper jaw. Maxilla almost reaching the vertical of the hinder orbital margin. Anterior nostril in a short tube, the posterior a large opening, much nearer the eye than the end of the snout. An outer row of curved, subulate teeth in the premaxillary,

decreasing in size backwards; an inner row of large, acicular, depressible teeth, and an intermediate series of minute teeth between them. Mandibular teeth similar to those of the upper jaw anteriorly, but the fixed teeth are smaller laterally, and the minute ones are lost on the sides. Tongue largely free, deeply notched anteriorly. Gill-membranes united across the isthmus; free-edge of shoulder-girdle smooth, without papillæ.

Body subcylindrical anteriorly, compressed posteriorly, and covered with large, angular, ctenoid scales, which are largest posteriorly. They extend forward to a little behind the eyes above, and onto the breast and the base of the pectorals. Genital papilla very small.

First dorsal commencing a little behind the base of the pectoral; second spine longest, and the margin of the fin rounded. Dorsal rays subequal in height, the last reaching backward to about three quarters of its distance from the hypural joint. Anal opposite the soft dorsal, its rays increasing in height backwards. Pectoral reaching the vertical of the vent. Ventrals completely united, and reaching the vent; they are inserted beneath the base of the pectoral. Caudal somewhat pointed, the lower rays obliquely truncate.

*Colour-marking*.—Brown in alcohol, the scales of the lower half of the sides lighter, with broad brown margins; about six dark blotches along the sides, and three or four narrow, dark horizontal lines along the series of scales. Head dark speckled, with a light marking from the eye to the mouth. First dorsal dark, with some broad lighter markings basally; a dark blotch between the first and second spines, and a black, light-edged ocellus between the fifth and sixth spines. Second dorsal dark, with microscopic, blackish dots, which form darker spots in irregular rows. Anal blackish, the rays lighter, and some white spots posteriorly. Caudal grey above, with indefinite darker bars; the lower portion bears three or four broad dark cross-bars, which are darkest basally, and separated by light interspaces. Pectoral with a dark horizontal bar on the lower portion of its base. Ventrals with dark transverse bars.

Described from a specimen 85 mm. long. A second taken with it does not offer any noticeable differences.

*Synonymy*.—These examples agree so well with the description and figure of *G. vauiganius*, Jordan and Seale, that they are evidently identical with that species. We have also compared them with an Indian example of *G. biocellatus*, received from Dr. Francis Day, which, though in rather bad condition, is evidently similar in all details. We therefore regard *G. vauiganius* as synonymous with *G. biocellatus*.

*Loc.*—Finches' Creek, Cooktown, North Queensland; coll. A. R. McCulloch.

#### PARAGOBIODON, Bleeker.

*Rüppellia* and *Rüppellia*, Swainson, Nat. Hist. Class. Amph. Rept. Fish., ii., 1839, pp. 184, 281 (*Gobius echinocephalus*, Rüppell). Not *Rüppellia*, Wiedemann, 1830, a genus of Diptera.

*Rüppellia* (Swainson) Jordan & Richardson, Check-list Fish. Philippine Arch., 1910, p. 47.

*Paragobiodon*, Bleeker, Ned. Tijdschr. Dierk., iv., 1873, p. 129 (*Gobius echinocephalus*, Rüppell)<sup>16</sup>. *Id.*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 309. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 396.

Form short and compressed, head subglobular. Body with large ctenoid scales. Head naked, with papillæ or setæ; some large open pores on the upper surface of the head, behind the eye and preopercular margin. Snout rounded, jaws subequal, mouth very oblique; nostrils in short tubes; no barbels. A band of villiform teeth in each jaw, and an outer row of enlarged teeth; mandible with a curved canine on each side of the symphysis; palate toothless. Tongue rounded, free anteriorly. Gill-openings lateral, isthmus very broad. Exposed edge of shoulder-girdle a smooth ridge. Pseudobranchiæ present; gill-rakers few, short and spinate. Dorsal with about  $vi/10$  rays, short and rounded; anal similar to second dorsal, with about 10 rays. Pectorals large, without free rays. Ventrals united, cup-shaped, with  $i/5$  rays. Caudal rounded.

PARAGOBIODON ECHINOCEPHALUS, Rüppell.

(Plate xxxiv., fig. 1.)

*Gobius echinocephalus*, Rüppell, Atlas Fische Roth. Meers, 1828, p. 136, pl. xxxiv., fig. 3, and Nene Wirbelth., Fische, 1838, p. 138. *Id.*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 134. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 34, and Fische Südsee, vi., 1877, p. 175, pl. cviii., fig. d. *Id.*, Klunzinger, Verh. Zool. Bot. Ges. Wien, 1871, p. 475.

*Gobius amiciensis*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 135. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 35. *Id.*, Sauvage, Poiss. Madagascar, 1891, p. 352, pl. xli.

*Gobius xanthosoma*, Bleeker, Nat. Tijdschr. Ned. Indie, iii., 1852, p. 703. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 42.

*Gobius melanosoma*, Bleeker, Nat. Tijdschr. Ned. Indie, iii., 1852, p. 703. *Id.*, Peters, Monatsbr. Ak. Berlin, 1868, p. 265. *Id.*, Day, Fish. India, 1876, p. 297, pl. lxiv., fig. 1.

*Gobius gobiodon*, Day, Proc. Zool. Soc., 1869, p. 516.

*Gobius gibbosus*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 601.

*Gobius scabriceps*, Macleay, Loc. cit., p. 603.

*Gobius waitii*, Garman, Bull. Mus. Comp. Zool., xxxix., 1903, p. 234, pl. iii., fig. 3.

*Paragobiodon echinocephalus*, Bleeker, Nederl. Tijdschr. Dierk., iv., 1873, p. 129, and Verh. Akad. Amsterdam, xviii., 1879, p. 17. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 397.

*Paragobiodon xanthosomus*, Bleeker, Arch. Néerl. Sci. Nat., xiii., 1878, p. 54. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 397.

<sup>16</sup> Fide Weber & de Beaufort—Fish. Indo-Austr. Arch., i., 1911, p. 289.

*Paragobiodon melanostoma*, Bleeker, Resch. Faun. Madagascar, 1875, p. 78, and Arch. Néerl. Sci. Nat., xiii., 1878, p. 54.

*Ruppellia echinocephala*, Jordan & Richardson, Check-list Fish. Philippine Islands, 1910, p. 47. *Id.*, Ogilby, Mem. Qld. Mus., ii., 1913, p. 92.

*Ruppellia melanostoma*, Jordan & Richardson, *Loc. cit.*

D. vi/10; A. 10; P. 20; V. i/5; C. 17. 24 scales between the axil and the hypural joint, and 10 between the anterior dorsal and anal rays.

Depth 3 in the length to the hypural joint; head 3·2 in the same. Eye 3·7 in the head, a trifle longer than the snout, and 1·6 in the interocular space. Breadth before the bases of the pectorals 1·4 in the depth; depth of the caudal peduncle 1·7 in the head.

Head a little deeper than long, naked, with bristle-like filaments; these are longest and most numerous on the lower surfaces, while they also cover the operculum and occiput, and leave the upper portion of the cheek and side of the neck bare. Some large open pores are present on the preopercular border, behind the eye, and on the interorbital area. Eyes in the anterior half of the head, separated by a wide convex interorbital space. Snout very obtuse, the anterior profile subvertical, the upper arched evenly backward to the dorsal spines; chin prominent. Mouth subvertical, the maxilla reaching to below the anterior border of the eye. Nostrils large, the anterior in a tube near the lip, the posterior almost above the margin of the eye and with a raised margin. A band of villiform teeth in each jaw, the outer ones enlarged anteriorly; a strong inner canine on each side of the mandibular symphysis, followed by two or three smaller ones towards the sides. Tongue thick, rounded anteriorly and free. Gill-openings opposite and about as wide as the bases of the pectorals, narrower than the isthmus separating them; shoulder-girdle smooth.

Body short and thick, with large ctenoid scales which commence abruptly on an oblique line extending from the axil to the anterior dorsal ray; abdomen largely scaly, the base of the pectoral and the breast naked, the latter with filaments similar to those of the head. Median row of body scales with vertical series of minute mucigerous papillæ. Genital papilla large.

First dorsal fin rounded and connected with the base of the second by membrane; the fourth spine is longest, and about once and two-thirds as long as the eye. Second dorsal somewhat rounded and higher than the first, the median rays longest, the posterior not reaching the base of the caudal. Anal opposite the soft dorsal, the rays increasing in height to the eighth. Pectoral large and rounded, reaching to above the third anal ray. Ventrals rounded and cup-shaped, their lower surfaces densely papillose; the spines are broad with a furrow on their anterior faces, and bent backward at their tips; they support a strong basal membrane. Caudal rounded.

*Colour*.—Uniformly bleached after long preservation in alcohol. Uniform reddish-brown, according to Macleay.

Described from one of the three cotypes of *Gobius scabriceps*, Macleay, 30 mm. long; this differs from its brief description in having the diameter of the eye two thirds as wide as the interocular space instead of less than one half. The accompanying figure represents a smaller specimen,  $23\frac{1}{2}$  mm. long, from Masthead Island, which differs principally in having the head lighter in colour than the body, and covered with only papillæ instead of filaments.

*Variation.*—A careful comparison of sixty-two specimens, 12-34 mm. long, indicates that this species is highly variable in its colouration, but that such variations do not represent even subspecific characters. (A) Five examples from Masthead Island have the body and fins brownish-black with the head flesh-coloured. (B) Four others from Green Island are more nearly uniform brown, the body being lighter and the head not so pale. (C) Of five small specimens from Murray Island, one is like A; the others have all the fins except the ventrals blackish, while the head and body is flesh-coloured; four others from Masthead Island are similarly coloured. (D) Four specimens from German New Guinea are each differently coloured, and are somewhat intermediate between forms C and E. (E) Thirty-six from Masthead Island and three from Murray Island are light coloured all over, grass-green in life, with the margin of the caudal dark and usually of the dorsal and anal also.

The filaments on the head are more papillose in the small dark coloured examples than in the lighter ones of similar size, in which they are setiform, and they are less abundant on the nape; this feature is variable however, and offers no specific character. In younger specimens also, the scales near the dorsal and anal fins are imperfectly developed, so that they appear less numerous in a transverse series than in adults.

*Synonymy.*—The variability of this species has caused writers to bestow several names upon it. *Gobius amiciensis*, Cuvier and Valenciennes, was reduced to the synonymy of *G. echinocephalus* by Klunzinger, who has been followed by later authors. *G. xanthosoma*, Bleeker, and *G. melanosoma*, Bleeker, are also identical with *G. echinocephalus* according to Weber. *G. gobiodon*, Day, was relegated to the synonymy of *G. melanosoma* by its author, while *G. waitii*, Garman, is evidently another synonym, as suggested by Jordan and Seale under *G. xanthosoma*. Finally, we have compared the types of *G. gibbosus*, Macleay, and *G. scabriceps*, Macleay from the Endeavour River, and find them identical in all details, and evidently synonymous with *G. echinocephalus*.

*Localities of specimens examined.*—Masthead Island off Port Curtis, and Green Island off Cairns, Queensland; coll. McCulloch. Endeavour River, Queensland; types of *G. gibbosus* and *G. scabriceps*. Murray Island, Torres Strait; coll. Hedley and McCulloch. German New Guinea, Duke of York Island, and Bougainville Island.

#### Genus *ZONOGOBIUS*, Bleeker.

*Zonogobius* (Bleeker), Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 397.

*ZONOGOBius NUCHIFASCIATUS*, *Günther*.*Gobius nuchifasciatus*, *Günther*, *Journ. Mus. Godeff.*, i. 4, 1874, p. 266.*Zonogobius semidoliatus*, *McCulloch*, *Proc. Linn. Soc. N.S.Wales*, xxxvi., 1912, p. 606 (Not of *Cuvier & Valenciennes*).

The Queensland specimens recorded by McCulloch as *Z. semidoliatus* differ from that species in having a distinct membrane uniting the ventral spines, while the cephalic colour-bars are less distinct. They are apparently referable to *G. nuchifasciatus*.

*Loc.*—Dunk Island, Queensland, and Masthead Island, off Port Curtis, Queensland. Gunther's specimens were collected at Bowen, Queensland.

(GOBIUS) *LIDWILLI*, *McCulloch*.*(Gobius) lidwilli*, *McCulloch*, *Rec. Austr. Mus.*, xi. 7, 1917, p. 185, pl. xxxi., fig. 2.*Loc.*—Near Sydney.[GOBIUS] *BIFRENATUS*, *Kner*.

*Gobius bifrenatus*, *Kner*, *Reise "Novara," Zool.*, ii., 1865, p. 177, pl. vii., fig. 3. *Id.*, *Klunzinger, Sitzb. Akad. Wiss. Wien*, lxxx. i., 1879, p. 383. *Id.*, *Macleay, Proc. Linn. Soc. N.S.Wales*, v., 1881, p. 597. *Id.*, *Ogilby, Cat. Fish. N.S.Wales*, 1886, p. 35. *Id.*, *Lucas, Proc. Roy. Soc. Vict. (2)*, ii., 1890, p. 28. *Id.*, *Waite, Mem. N.S.Wales Nat. Club*, ii., 1904, p. 46.

*Gobius bussensis*, *Castelnau*, *Proc. Zool. Soc. Vict.*, i., 1872, p. 123.

*Gobius caudatus*, *Castelnau*, *Ibid.*, ii., 1873, p. 47. *Id.*, *Macleay, Proc. Linn. Soc. N.S.Wales*, v., 1881, p. 600. *Id.*, *Lucas, Proc. Roy. Soc. Vict. (2)*, ii., 1890, p. 29.

D. vi/11; A. 11; P. 17; V. i/5; C. 15. Scales in about 37 rows between the base of the pectoral and the hypural joint, and about 12 between the anterior dorsal and anal rays.

Depth 5·1 in the length to the hypural joint; head 4 in the same. Eye 4·6 in the head; interocular space 2·8 in the eye. Snout 3·8, depth of caudal peduncle 2·1 in the head.

Head naked, swollen, with the usual preopercular, nuchal, occipital and rostral pores; rows of minute pores on the cheeks and opercles, mandible, snout, occiput and shoulders. Eyes of moderate size, cutting the dorsal profile, and separated by a narrow bony ridge. Snout convex, a little longer than the eye. Mouth oblique, maxillary reaching to below the middle of the eye; mandible not projecting beyond the upper jaw. An outer row of enlarged teeth in each jaw, some of which are caniniform; these are followed by a band of villiform teeth, and an inner series of slightly larger teeth: palate and tongue toothless. Tongue rounded anteriorly, slightly notched on the median line. Gill-opening very wide, the isthmus scarcely wider than the eye; shoulder-girdle smooth.

Body compressed, the breadth between the pectorals 1·4 in its depth. It is covered with ctenoid scales which are large and regular posteriorly, but small and irregular anteriorly. They extend forward to above the operculum, leaving the nape and pectoral base naked; thorax scaly. There are approximately thirty-seven rows between the upper base of the pectoral and the hypural joint, but the anterior scales are so irregular that either more or less may be counted. Genital papilla well developed.

First dorsal rounded, the fourth and fifth rays longest, as long as the postorbital portion of the head; second dorsal rays increasing in height backwards, the last as long as the head without the operculum, and reaching to the base of the caudal rays. Anal of similar form to the second dorsal, commencing behind its second ray, and terminating slightly behind its last; the last ray is as long as that of the second dorsal. Pectoral somewhat pointed, its eleventh ray longest, reaching to a little behind the vertical of the vent. Ventrals completely united, not quite reaching the vent. Caudal elongate, pointed, the median rays longer than the head and trunk.

General colour light green in life, abdomen white. Muzzle and throat greenish-black; a broad purplish-black bar from below the eye extends obliquely across the opercles to the lower base of the pectoral, and terminates between the pectoral and ventral bases; another bar is situated in the nuchal groove, and extends backward on the body to below the last dorsal spine; an interrupted, curved bar commences behind the eye, and crosses the cheek to behind the mouth; upper lip blackish. An incomplete dark bar commences beneath the pectoral, and running downward, breaks up into a row of blackish blotches above the anal fin. Many of the scales near the back on the hinder part of the body bear oblique, purplish streaks near their margins. Large opalescent spots are arranged in two irregular rows on the anterior half of the body, the base of the pectoral, thorax, and the preoperculum. Dorsal fins with a broad, horizontal, dark bar near their bases, the remainder of the fins almost hyaline; anterior spines tipped with orange. Caudal dark green, with a pale yellowish border, and a lighter median area; about five broad purple bars cross the basal half obliquely, and become broken up into broad interradial spots distally. Anal pale orange basally, with a broad greyish border. Ventrals similar to the anal, pectoral greenish-grey.

Described from a fresh specimen 142 mm. long, secured by Mr. J. H. Wright at Sans Souci, Botany Bay. It was caught in a prawn-net, among sea-grass (*Zostera*), where the species is not uncommon. A fine series of seventy specimens, ranging from 28 mm. in length, shows that the characteristic markings of this species are developed early in life, and vary but little. The posterior dorsal and anal rays, and the median caudal rays are proportionately shorter in the younger examples, but in all other details they are very similar to the adults.

*Synonymy.*—Klunzinger suggested the identity of *G. bassensis*, Castelnau, and *G. bifrenatus*, but counted about 50 scales in the latter species, whereas according to Castelnau, there are only 38 on the lateral line. I find them very irregular anteriorly and variable in number, but

they appear to be usually nearer forty than fifty. We have examined a photograph of the type of *G. caudatus*, Castelnau, which is preserved in the Paris Museum, and are convinced that species also is synonymous with *G. bifrenatus*.

*Locs.*—Botany Bay and Port Jackson. Richmond River estuary, northern New South Wales. Eden, south coast of New South Wales. Near the Yarra River mouth, Hobson Bay, Victoria. Goolwa, Noarlunga, and near Adelaide, South Australia.

*Hab.*—This species has so far been recognised only from New South Wales and Victorian waters. Many specimens lent for examination by the South Australian Museum, prove the species to be common in the estuarine waters near Adelaide also.

[*GOBIUS*] *SEMIFRENATUS*, Macleay.

(Plate xxxiv., fig. 2.)

*Gobius semifrenatus*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 598. *Id.*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 35. *Id.*, Waite, Mem. N.S.Wales Nat. Club, ii., 1904, p. 46.

D. vi/11; A. 12; P. 17; V. i/5; C. 17. About 32 scales from above the base of the pectoral to the hypural joint, and about 11 between the anterior dorsal and anal rays.

Depth almost 5 in the length to the hypural joint; head 3·6 in the same. Eye 4·6 in the head, shorter than the snout. Interocular space 3 in the eye. Snout 3·8, depth of the caudal peduncle 2·3 in the head.

Form and structural details almost exactly similar to those of *G. bifrenatus*, but with the scales rather more regular and somewhat larger anteriorly. The posterior dorsal and anal rays are a little shorter, and the caudal is less produced, the median rays being only 0·2 longer than the head.

Colour green, white below. Snout and upper surface of the head with numerous small dark spots, which become larger on the nape; a broad incomplete dark bar extends from below the eye, across the opercles to the lower base of the pectoral, and terminates between the pectoral and ventral bases; another imperfect bar is situated in the nuchal groove, and ends in a dark shoulder-spot. An incomplete dark bar commences behind the pectoral and becomes confused with a row of seven or eight dark blotches on the lower portion of the sides, which are correlated with some irregular transverse bars on the body. Many scales on the anterior parts of the sides with opalescent spots. Dorsal fins with series of grey spots forming oblique rows which run forward and upward; a broad light margin to each fin. Caudal with small dark, light-edged spots between the rays near the base; rarely these coalesce to form a broad bar at the extreme base. Anal and ventral dusky.

Described and figured from a specimen 113 mm. long.

A series of thirty-six specimens, 52-113 mm. long, including Macleay's types, indicates that *G. semifrenatus* may be distinguished from *G. bifrenatus* by certain differences in the colour-marking. *G. bifrenatus* has well defined bridle-marks, and the upper surface of the head without spots; body without cross-bars; dorsal fins longitudinally banded, and the caudal with broad bars. In *G. semifrenatus* the bridle-marks are less definite, and the head is distinctly spotted above; body with cross-bars; dorsal fins with oblique rows of grey spots, and the caudal with small interradial spots. The two species are very similar in structure, differing only in the form of the caudal fin, and in the disposition of the anterior scales. They have been captured together in a prawn-net at Sans Souci, Botany Bay, by Mr. J. H. Wright, but as the two forms of colour-marking do not appear to be correlated with either growth or sex, we regard them as representing distinct species.

*Locs.*—Specimens are in the Australian Museum from Port Jackson and Botany Bay, New South Wales.

*Hab.*—New South Wales.

Genus *RHINOGOBius*, *Gill.*

*Rhinogobius*, *Gill*, Proc. Acad. Nat. Sci. Philad., 1859, p. 145 (*R. similis*, *Gill*).

Body robust, compressed, covered with large ctenoid scales, which become cycloid on the breast and the base of the pectoral. Head entirely naked, with lines of mucigerous pores crossing the cheeks and opercles, and large open pores above the nostrils, on the interorbital space, along the nuchal groove, and around the preopercular margin. Snout obtuse, the profile convex. Jaws subequal. Mouth a little oblique; no barbels. A band of villiform teeth in each jaw, and an outer series of enlarged ones; a subcaniniform tooth may be present on each side of the mandible. Tongue subtruncate, and free anteriorly. Gill-openings lateral, the isthmus broad. Exposed edge of the shoulder-girdle smooth. Pseudobranchiæ present. Gill-rakers short and thick, about five on the lower limb of the first arch. Dorsal fins short, with about six spines and ten rays; anal similar to the soft dorsal. Pectorals rounded, without free rays. Ventrals large, united, with a broad basal membrane; they have one spine and five rays. Caudal rounded.

The above definition is based upon *R. nebulosus*, *Forskal*, and *R. leftwitchi*, *Ogilby*.

Key to the Australian species.

- a. Eye larger; three large dark lateral blotches, scales without dark borders..... *nebulosus*.
- aa. Eye smaller; five smaller lateral blotches, scales with dark borders..... *leftwitchi*.

*RHINOGOBius NEBULOSUS*, *Forskal*.

*Gobius nebulosus*, *Forskal*, Descr. Anim., 1775, p. 24. *Id.*, *Bloch* and *Schneider*, Syst. Ichth., 1801, p. 72. *Id.*, *Cuvier* and *Valenciennes*, Hist. Nat. Poiss., xii., 1837, p. 84.

*Gobius criniger*, Cuvier & Valenciennes, *Ibid.*, p. 82. *Id.*, Richardson, Ichth. "Erebus & Terror," 1844, p. 2, pl. i, figs. 3-4. *Id.*, Cantor, Cat. Malay. Fish., 1850, p. 184. *Id.*, Bleeker, Nat. Tijd. Ned. Ind., iii., 1852, p. 453. *Id.*, Günther, Cat. Fish. Brit. Mus., iii., 1861, p. 29. *Id.*, Day, Fish. Malabar, 1865, p. 111, and Fish. India, 1876, p. 288, pl. xlii., fig. 2. *Id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i., 1877, p. 330. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 356, and v., 1881, p. 595. *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 461.

*Gobius brevifilis*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 90. *Id.*, Day, Proc. Zool. Soc., 1867, p. 940. *Id.*, Günther, Fische Südsee, vi., 1877, p. 176, pl. eviii., fig. g. *Id.*, Sauvage, Hist. Madag., xvi., 1891, pl. xli., fig. 2.

*Gobius caninus* var. *africanus*, Playfair, Fish. Zanzibar., 1866, p. 71, pl. ix., fig. 1.

*Gobius caninus* (var. *africanus*), Steindachner, Sitzb. Akad. Wiss. Wien, lvi. i., 1867, p. 313 (not *G. caninus*, Cuv. & Val.).

*Gobius anchenotaenius*, Bleeker, Arch. Néerl. Sci. Nat., ii., 1867, p. 415, and in Pollen & van Dam, Faun. Madag., iii., 1874, p. 56, pl. xviii., fig. 1. *Id.*, Sauvage, Hist. Madag., xvi., 1891, pl. xxxix., fig. 3.

*Ctenogobius criniger*, Bleeker, Arch. Néerl. Sci. Nat., xiii., 1878, p. 54.

*Gobius festivus*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 687.

*Coryphopterus criniger*, Seale, Occ. Pap. Bishop Mus., iv., 1906, p. 84.

*Rhinogobius nebulosus*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 401. *Id.*, Jordan & Richardson, Bull. U.S. Fish. Bureau, xxvii., 1908, p. 276, and Check List Fish. Philipp. Is., 1910, p. 47.

*Rhinogobius lunig*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxvi., 1907, p. 41, fig. 13.

D. v(vi)/10; A. 10; P. 18; V. i/5; C. 13. 31 rows of scales between the upper base of the pectoral and the hypural joint, and 13 between the anterior dorsal and anal rays.

Depth 4·3 in the length to the hypural joint, head 3·1 in the same. Orbit 3·5 in the head, longer than the snout, which is 4·1 in the head; interorbital width 3·5 in the orbit. Breadth between the pectoral bases 1·2 in the depth. Depth of the caudal peduncle 2·5 in the head. Third dorsal spine 1·3, third dorsal ray 2·1, and the penultimate anal ray 2·08 in the head; pectoral 1·5, and caudal 1·3 in the head.

Head naked; cheeks and operculum with many rows of mucigerous pores, which also extend onto the snout, nape and mandible; larger open pores are present on the upper surface of the head, along the nuchal groove and around the preopercular border. Eyes large, separated by a narrow, concave interorbital space. Snout forming a convex curve and broadly rounded anteriorly; anterior nostril in a short tube, the posterior a simple opening. Mouth oblique, jaws equal, the maxilla reaching to below the anterior fourth of the eye. A band of villiform teeth in each jaw, and an outer row of enlarged subulate ones anteriorly, which extend

onto the sides and decrease in size backwards in the premaxillaries; no true canines. Tongue subtruncate and free anteriorly. Gill-openings lateral, separated by a wide isthmus; exposed edge of the shoulder-girdle forming a curved smooth ridge.

Body rather stout, compressed. It is covered with large, strongly ctenoid scales, which are reduced and rudimentary before the dorsal fin, and leave the nape and portion of the neck bare; they are cycloid and small on the breast and bases of the pectorals. Genital papilla well developed.

First dorsal originating above the anterior portion of the pectoral; the second and third spines are filiform and free terminally, and reach well beyond the anterior ray when adpressed. Margin of the second dorsal straight, rounded posteriorly; the rays are subequal in height, and the posterior ones do not reach the caudal when adpressed. Anal similar to the soft dorsal, the rays increasing slightly in length to the penultimate. Pectoral rounded, not quite reaching the vertical of the anterior dorsal ray. Ventrals united, reaching the vent, with a broad basal membrane. Caudal rounded.

*Colour-marking.*—Light brown in alcohol, lighter below, with large well-defined, blackish-brown spots on the back and sides; a large spot is beneath the pectoral below the posterior dorsal spines, another below the hinder part of the soft dorsal, and one at the base of the tail; a paired series crosses the nape, another before the dorsal fin, six cross the back and sides near the hinder part of the spinous dorsal, a pair is near the middle of the soft dorsal, one behind the last ray, and a small one near the caudal base; in addition there are numerous intermediate lighter and smaller spots on the upper half of the body. A dark bar from the orbit to the mouth, and a larger one from behind the eye to behind the angle of the mouth. Operculum and base of the pectoral with several large blotches. First dorsal with a median row of blackish spots, its outer portion dusky, and the ends of the spines black. Second dorsal with three irregular rows of blackish, light-edged ocelli between the rays, and a black margin. Caudal with about five rows of similar ocelli, and a dark border. Anal with a black border.

Described from a specimen 99 mm. long, from Port Darwin, which is unusual in having only five instead of six dorsal spines.

*Variation.*—Thirty-two specimens 30-117 mm. long, prove the markings of this species to be very constant in disposition though variable in their intensity; the dark borders of the vertical fins may be absent, especially in young specimens, and that of the anal is replaced by a median dark band in some of our younger examples. The filaments of the dorsal spines vary in length, and may be longer in young specimens than in those of larger size, while they are occasionally scarcely developed.

*Synonymy.*—Four cotypes of *Gobius festivus*, De Vis, agree with their description in the more obvious characters, but prove it to be inaccurate in various details. The upper pectoral rays are not free or silky, and the scales do not extend forward to the orbit on the sides of the neck. The

maxilla reaches to below the anterior portion of the eye instead of nearly to the middle, and the first dorsal is not lower than the second. They are similar in all details to an Indian example identified by Dr. Day as *G. criniger*, which is synonymous with *R. nebulosus*.

*Locs.*—We have examined specimens from the following localities. Shark Bay, West Australia. Port Darwin, North Australia. Sweers Island, Gulf of Carpentaria; coll. Hedley. Cape York, North Queensland; cotypes of *G. festivus*. Thursday Island, Torres Strait; coll. Hedley & McCulloch. Darnley Island, Torres Strait; coll. Dr. J. R. Tosh. New Hebrides. Madras, India; Dr. Day's collection.

*Distribution.*—Red Sea, Zanzibar, and Madagascar, through the Malayan Archipelago to the Pacific; Northern Australia. Bleeker<sup>17</sup> identified a Tasmanian fish as *G. criniger*, but this species does not occur so far south.

#### RHINOGOBUS LEFTWITCHI, *Ogilby*.

(Plate xxxiv., fig. 3.)

*Rhinogobius leftwitchi*, *Ogilby*, Proc. Roy. Soc. Qld., xxiii., 1910, p. 24.

D. vi/10; A. 10; P. 17; V. i/5; C. 13. 30 scales between the axil and the hypural joint, and eleven between the anterior dorsal and anal rays.

Depth before the ventrals 4·4 in the length to the hypural joint; head 3·5 in the same. Eye equal to the length of the snout, 3·6 in the head; interorbital space 2·6 in the eye. Depth of the caudal peduncle 2·5 in the head. Breadth before the pectoral bases 1·4 in the depth.

Head a little deeper than broad, entirely naked. Cheeks and operculum with many rows of mucigerous pores, arranged as shown in the figure; large open pores are present on the interorbital space, along the nuchal groove, and around the preopercular border. Eyes smaller than in *R. nebulosus*, separated by a narrow interorbital space. Snout obtuse, and broadly rounded; anterior nostril in a short tube near the upper lip, the posterior a simple opening near the eye. Mouth oblique, the maxilla reaching to below the anterior border of the eye; the mandible slightly longer than the upper jaw. A band of villiform teeth in each jaw, and an outer row of enlarged ones in the premaxillaries, which increase in size backwards; a small canine on each side of the mandible, between which is an outer enlarged row of teeth. Tongue subtruncate, and free anteriorly. Gill-openings lateral, separated by a broad isthmus; exposed edge of the shoulder-girdle smooth.

Body rather stout, compressed, and covered with large ctenoid scales, which become cycloid on the breast and the base of the pectoral fin; they extend forward to a short distance before the dorsal fin and the shoulder, but leave the nape and neck bare. Genital papilla well developed.

<sup>17</sup> Bleeker—Verh. Akad. Amsterdam, ii., 1855, p. 12.

First dorsal originating over the anterior half of the pectorals; the four anterior spines are somewhat filamentous, but reach only as far as the second ray when adpressed; the membrane from the last does not reach the second dorsal. Dorsal rays subequal in length, the margin of the fin a little rounded. Anal originating and terminating a little behind the second dorsal, its rays increasing gradually in length backwards. Pectoral broadly rounded, its middle rays not quite reaching the vertical of the anterior dorsal ray; no free upper rays. Ventrals large, almost reaching to the vent, and a little longer than the pectoral, the basal membrane well developed. Caudal rounded.

*Colour-marking.*—Light coloured in alcohol, each scale of the back and sides with an inframarginal dark brown angular mark. About seven rather indefinite bands across the back, between the nape and the caudal fin, and there is a median row of five dark spots between the pectoral and the hypural joint. Upper surface of the head and nape spotted and vermiculated with brown; an indistinct violaceous band extends downward from the eye to the angle of the mouth, and some indistinct bars on the cheeks terminate in two darker stripes on the bases of the pectorals. Fins hyaline; first dorsal with a longitudinal row of grey spots near the base, the remainder dusky; the anterior spine annulated with darker spots. Second dorsal with many oblique rows of grey spots, the anterior ray with darker annulations, and the fin has a broad lighter margin. Anal with a dusky border, and some dark spots between the hinder rays. Caudal with some light grey spots; pectorals and ventrals plain, the latter somewhat dusky.

Described and figured from an example 66 mm. long, from the typical locality.

This species is very similar in all its structural details to *R. nebulosus*, but differs in its colour-marking, and in having a much smaller eye. This is equal to the length of the snout in *R. leftwichi*, but is much longer than it in specimens of *R. nebulosus* of the same size as the example described above.

*Loc.*—Great Sandy Strait, Queensland.

(GOBIUS) *NEOPHYTUS*, *Günther*.

*Gobius neophytus*, Günther, Fische Südsee, vi., 1877, p. 174, pl. cviii., fig. e. *Rhinogobius neophytus*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 400, pl. xxxvii., fig. 2. *Id.*, McCulloch, Proc. Linn. Soc. N.S.Wales, xxxvi., 1911, p. 423.

*Loc.*—Murray Island, Torres Strait.

(GOBIUS) *LATERALIS*, *Macleay*.

var. *OBLIQUUS*, *var. nov.*

(Plate xxxiv., fig. 4.)

*Gobius lateralis*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 602. *Rhinogobius lateralis*, McCulloch and Waite, Rec. S.Austr. Mus., i. 1, 1918, p. 48, pl. ii., fig. 3.

This variety appears to be quite similar to *G. lateralis*, Macleay, from Southern Australia, in both form and the disposition of its colour-marking, but the large dark lateral spots are always elongate and disposed obliquely in examples from near Sydney, instead of being rounded. Local examples exhibit the same variation in the relative lengths of their dorsal and anal rays as noted in South Australian specimens.

The specimen figured is 56 mm. long. Not being full-grown, its fin-rays are shorter than in older examples, but it exhibits the characteristic marking of the variety.

*Locs.*—Parramatta River estuary and Rose Bay, Port Jackson. Lake Illawarra, New South Wales. A single example in the old collection of the Australian Museum is said to have been obtained at Lord Howe Island.

Genus *WAITEA*, *Jordan and Seale*.

*WAITEA MAXILLARIS*, *Macleay*.

(Plate xxxv., fig. 3.)

*Gobius maxillaris*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 357, pl. ix., fig. 2.

D. vi/11; A. 10; P. 17; V. i/5; C. 15. Scales about 43; l. tr. 16. Depth 4·1 in the length to the hypural joint; head 3 in the same. Orbit (not eye) 3·1 in the head; interorbital width 5·2, snout 1·6 in the orbit. Depth of caudal peduncle 2·5 in the head.

Head apparently naked, showing no mucous system, and only the usual preopercular, nuchal, occipital and rostral pores. Eye of moderate size, the orbit cutting the profile; interorbital space very narrow, less than one-fifth the width of the orbit. Snout shorter than the orbit, its profile very oblique. Anterior nostril with dermal margins, the posterior a large open pore. Maxillary slender, produced backward towards the preopercular angle; mandible projecting beyond the premaxillaries. Teeth in a villiform band in each jaw, premaxillaries with an outer row of enlarged, cardiform, curved, movable teeth; mandibular teeth ending on each side in two or three small, fixed canines: palate and tongue toothless. Tongue truncate anteriorly.

Body compressed, covered with strongly ctenoid scales of moderate size, which extend forward to above the pectoral base and on the thorax; the area before the dorsal fin and the base of the pectoral are now naked, but may have been scaly in life. A small genital papilla.

First dorsal originating just behind the pectoral, its spines filamentous; the first is a little longer than the head, the following shorter and decreasing backwards. Second dorsal increasing in height backward to the penultimate ray, which is as long as the head without the operculum. Anal originating a little behind the second dorsal and terminating in advance of it; it is of similar form to that fin, and but little lower. Pectoral without free rays, rounded, and reaching to above the second anal ray. Ventrals large, inserted a little before the pectorals, and almost reaching the anal. Caudal apparently rounded.

The colour is completely faded in the type. According to Macleay, it was pale reddish or yellowish brown, with a few indistinct cross-bars of a deeper brown; fins of a blackish tinge without spots; opercles dotted with minute spots.

Described and figured from the typical and unique example preserved in the Macleay Museum, which is 65 mm. long. It is very dilapidated, so the forms of the caudal and pectoral fins and the extent of the squamation may not be accurate in our figure. It is apparently a species of *Waitea*.

Loc.—Port Darwin.

AMBLYGOBIUS, Bleeker.

*Amblygobius*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 322 (*Gobius sphynx*, Cuv. & Val.).

*Odontogobius*, Bleeker, *Ibid.*, p. 323 (*Gobius bynoensis*, Rich.).

Body of moderate breadth, compressed. Scales rather small, mostly ctenoid but cycloid anteriorly, covering the breast and base of the pectoral; a few imperfect scales on the upper part of the operculum. Head with fine rows of mucigerous papillæ. Snout somewhat tumid, jaws subequal. Mouth moderate, a little oblique; no barbels. An outer row of larger teeth in each jaw anteriorly, followed by an inner series of smaller ones; large canines on the sides of the mandible; palate toothless. Tongue subtruncate anteriorly, its tip free. Gill-openings broad, separated by a wide isthmus; shoulder-girdle smooth. Pseudobranchiæ present; gill-rakers few, and obsolete on the outer anterior margin of the first arch. Dorsals almost contiguous, with about vi/15 rays; anal opposite and of similar form to the second dorsal, with about 15 rays. Ventrals large, united, with i/5 rays. Caudal rounded.

- a. Ventrals not reaching the vent in adults. Caudal fin plain; cross-bands of body ill defined..... *bynoensis*.
- aa. Ventrals reaching to or beyond the vent in adults. Caudal fin with one or more dark spots; cross-bands of body well defined..... *phalaena*.

AMBLYGOBIUS BYNOENSIS, Richardson.

(Plate xxxv., fig. 2.)

*Gobius bynoensis*, Richardson, Ichth. "Ereb. & Terr.," 1844, p. 1, pl. i., figs. 1-2. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 70. *Id.*, Steindachner, Sitzb. Akad. Wiss. Wien., lvi. i., 1867, p. 314. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 61. *Id.*, Peters, Monatsbr. Akad. Wiss. Berlin, 1868, p. 266. *Id.*, Day, Fish. India, 1876, p. 284, pl. lxi., fig. 3. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 382. *Id.*, Günther, "Challenger" Rept., Zool., i., 1880, p. 44. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 607. *Id.*, Weber, Zool. Forschr. Austr., y., 1895, p. 269.

*Gobius stethophthalmus*, Bleeker, Nat. Tijdschr. Ned. Ind., i., 1851, p. 249, fig. 17.

*Odontogobius bynoensis*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874 (*sic!* Day).

*Apocryptes lineatus*, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i., 1877, p. 332, pl. xii., fig. 3. *Id.*, Macleay, *Loc. cit.*, v., 1881, p. 611.

*Apocryptes bivittatus*, Macleay, *Loc. cit.*, ii., 1878, p. 357, pl. ix., fig. 5, and v., 1881, p. 611.

*Amblygobius bynoensis*, Jordan & Richardson, Check List Fish. Philippine Arch., 1910, p. 49. *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 472.

D. vi/15; A. 16; P. 18; V. i/5; C. 15. 64 scales between the upper base of the pectoral and the hypural joint, and about 26 between the anterior dorsal and anal rays.

Depth 4·5 in the length to the hypural joint; head 3·7 in the same. Eye 4·3 in the head, 1·3 in the snout, which is 3·2 in the head; interorbital space 1·2 in the eye. Depth of caudal peduncle 1·9, and caudal fin 1·1 in the head. Breadth at the bases of the pectorals 1·3 in the depth of the body.

Head almost naked, a few rudimentary scales on the upper portion of the operculum. A few low ridges of mucigerous papillæ; rows of large open pores behind the preoperculum and above the operculum. Eyes of moderate size, separated by a rather broad, slightly convex interorbital space. Upper profile of the head and snout forming a convex curve. Anterior nostril in a short tube near the middle of the snout, the posterior a simple opening nearer the eye. Mouth a little oblique, maxilla reaching back to below the anterior margin of the eye; jaws subequal. Premaxillaries with several larger curved teeth on each side anteriorly, followed by a row of small ones which increase in size and become biserial backwards. Mandible with an outer row of larger curved teeth, and one or two curved canines on each side; behind these is a double row of small teeth which become uniserial on the sides. Palate toothless. Tongue subtruncate anteriorly, its tip free. Gill-openings separated by a wide interspace; exposed edge of the shoulder-girdle smooth.

Body rather broad, compressed. It is covered with rather small scales which extend forward to behind the eyes, and cover the breast and base of the pectoral; they are mostly ctenoid, but are cycloid anteriorly and on the abdomen. A minute genital papilla.

First dorsal fin commencing behind the vertical of the pectoral base; the spines increase in length to the fifth, and the membrane from the last touches the base of the first ray. Dorsal rays subequal in length, the posterior ones forming a pointed lobe which overlaps the caudal base. Anal of similar form to the second dorsal, the rays increasing slightly in length backwards. Pectoral rounded, reaching the vertical of the first dorsal ray. Ventrals inserted slightly before the pectorals, completely united, and reaching three-fourths of their distance from the vent. Caudal broadly rounded.

*Colour-marking*.—A broad dark band commences on the snout, and extends backward to below the anterior dorsal rays; a second extends from behind the mouth across the opercles to the pectoral base, and is

lost behind that fin. About seven cross-bands descend from the back below the dorsal fins, the anterior ones being narrower and connecting with the longitudinal band. A large dark spot at the base of the tail. Upper surface of the head and neck with paired rows of large dark-edged ocelli, and there are some light lines bordering the darker bands on the head. Upper anterior portion of the body with some silvery dots between the dark bands. First dorsal with a large dark blotch on the basal portions of the third to the fifth dorsal spines, and another on the sixth; the fin has a broad dark margin, and there are some cloudy markings on the membrane. Soft dorsal with four large dark blotches corresponding to the body-bars, and a broad grey margin, between which are several rows of cloudy spots between the rays. Anal with a broad grey margin, the other fins plain.

Described and figured from a beautifully preserved specimen, 92 mm. long, from Queensland. Some details of the colour-marking are supplemented with notes from other specimens. The markings are apparently subject to some little variation, and but few examples exhibit all those illustrated.

*Synonymy*.—The cotypes of *Apocryptes lineatus*, Alleyne & Macleay, are quite similar in all details to the specimen described above. The cotypes of *A. bivittatus*, Macleay, are largely bleached, but retain traces of the characteristic markings of *A. bynoensis*, with which they are evidently identical.

*Locs.*.—Queensland; figured specimen. Palm Islands, Queensland. Cape Grenville, Queensland; cotypes of *A. lineatus*. Thursday Island, Torres Strait; coll. A. R. McCulloch. Port Darwin, Northern Territory; cotypes of *A. bivittatus*. Malay Archipelago; Dr. Day's collection.

#### AMBLYGOBIUS PHALAENA, Cuvier & Valenciennes.

(Plate xxxv., fig. 1.)

*Gobius phalaena*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 92. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 67, and Fische Südsee, vi., 1877, p. 178, pl. exi., fig. c.

*Amblygobius phalaena*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 405. *Id.*, McCulloch, Proc. Linn. Soc. N.S. Wales, xxxvi., 1911, p. 347. *Id.*, Ogilby, Mem. Qld. Mus., ii., 1913, p. 90. *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 472. *Id.*, Regan, Proc. Zool. Soc., 1914, p. 650.

*Gobius annulatus*, De Vis, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 688.

D. vi/15; A. 15; P. 19; V. i/5; C. 15. 56 rows of scales between the upper base of the pectoral and the hypural joint, and about 22 between the anterior dorsal and anal rays.

Depth 3·7 in the length to the hypural joint; head 3·5 in the same. Eye equal to the length of the snout, and 3·4 in the head; interorbital width 1·6 in the eye. Depth of the caudal peduncle 1·8, and caudal fin 1 in the head. Breadth at the bases of the pectorals 1·6 in the depth of the body.

Head largely naked, a few small scales on the upper part of the operculum. Some fine rows of mucigerous papillæ are present on the cheeks, opercles, nape and sides of the neck, which are most striking below the eye. Some large open pores on the interorbital space, behind the eye and the preopercular border, and above the operculum. Eyes separated by a rather broad and almost flat interorbital space. Anterior nostril in a short tube, the posterior a simple opening. Upper profile of the head and snout forming a convex curve. Mouth a little oblique, the maxilla reaching to below the anterior portion of the eye; jaws subequal. Premaxillaries with an outer row of several enlarged teeth on each side, followed by an inner row of small ones, which increase in size and become biserial backwards. Mandible with an outer row of curved teeth anteriorly and a large curved canine on each side. Palate toothless. Tongue subtruncate anteriorly, its tip free. Gill-openings separated by a wide interspace; exposed edge of the shoulder-girdle smooth.

Body rather broad, compressed. It is covered with small scales which extend forward to behind the eyes, and cover the breast and base of the pectoral fin; they are mostly ctenoid, but are cycloid anteriorly and on the abdomen. A minute genital papilla.

First dorsal commencing behind the vertical of the pectoral base; the spines increase in length to the fourth, which is filamentous, and the membrane from the last almost reaches the base of the first ray. Dorsal rays subequal in length, the posterior ones forming a pointed lobe, which overlaps the base of the caudal. Anal of similar form to the soft dorsal, the rays increasing slightly in length backwards. Pectoral narrowly rounded, reaching the vertical of the anterior anal rays. Ventrals large, almost reaching the anal fin. Caudal broadly rounded.

*Colour-marking.*—Brown in alcohol, with five broad cross-bands; these are dark brown with blackish edges, and have narrow light stripes bordering them on each side on the lower portion of the body. Elongate dark-edged spots are present on the cheeks and opercles, and a paired series of them extends from the snout to the dorsal fin. A blackish spot is present on the shoulder, and two dark stripes extend backward on the upper anterior portion of the body. A large blackish blotch is present on the fifth to sixth dorsal spines, and narrow dark lines extend obliquely across the fin. Basal two-thirds of the second dorsal dark brown, and separated from a dark-edged marginal band by a light interspace. Anal dusky, nearly uniform. Ventrals with a narrow dark border. Pectorals and caudal pale yellow, the latter with a large blackish spot near the upper portion of its base, and a dark-edged light band near the upper margin.

Described and figured from a specimen 77 mm. long, from Murray Island.

*Variation.*—Six other examples, 26-110 mm. long, taken with the specimen described, exhibit striking changes in their colour-marking with growth. The younger examples are light with the cross-bands represented principally by narrow dark lines on the upper portion of the body; there are four interrupted dark longitudinal stripes on each side, and rounded light spots between the cross-bands; the soft dorsal has three dark spots

on its basal portion, and there is no marginal band. A specimen 86 mm. long is very similar to the one illustrated, but the dark margins of the cross-bands have disappeared; the caudal has three dark spots, and the soft dorsal has a dark median stripe above which are numerous rounded light spots in addition to the markings illustrated; the anal has a dark longitudinal stripe with light spots on each side of it, and a grey border. The largest example is very dark brown, which colour obscures most of the other marking; the pectoral and caudal are light, but the latter has a broad brown margin, and an inner dusky area with light spots.

A second series of nine specimens from the New Hebrides, 33-115 mm. long, exhibits a precisely similar range of variation.

*Synonymy*.—The typical examples of *G. annulatus*, De Vis, agree in all details with those described above.

*Locs.*—Murray Island, Torres Strait; coll. Hedley & McCulloch. Darnley Island, Torres Strait; coll. Dr. J. R. Tosh. Cape York, Queensland; cotypes of *G. annulatus*. Two Isles, off Cape Bedford, Queensland; coll. Hedley & Briggs. Masthead Island, off Port Curtis, Queensland; coll. D. B. Fry. New Hebrides; coll. Cummins & Stevens.

This species has further been recorded from Monte Bello Islands, Western Australia, by Regan.

(GOBIUS) *MICROLEPIDOTUS*, *Castelnau*.

*Gobius microlepidotus*, Castelnau, Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 20.

The very brief description of this species suggests that it is an *Amblygobius*, and is perhaps identical with *G. bynoensis*.

*Loc.*—Cape York (Castelnau).

Genus *CRYPTOCENTRUS* (Ehrenberg), *Cuvier & Valenciennes*.

*CRYPTOCENTRUS GOBIOIDES*, *Ogilby*.

(Plate xxxvi., fig. 1.)

*Gobius cristatus*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 610 (not of Day).

*Gobius gobiooides*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 35; substitute name. *Id.*, Waite, Mem. N.S.Wales Nat. Club, ii., 1904, p. 46.

*Amblygobius gobiooides*, Ogilby, Proc. Roy. Soc. Qld., xxiii., 1910, p. 25.

D. vi/13; A. 12; P. 16; V. i/5; C. 15. Scales very small, about 90 between the axil and the hypural joint.

Depth of the body before the ventrals 5·6 in the length to the hypural joint; head 3·8 in the same. Eye 6 in the head, shorter than the snout, which is 4·8 in the head; interocular space 1·5 in the eye. Depth of caudal peduncle 2·4 in the head. Breadth at the pectoral bases 1·3 in the depth.

Head subcylindrical, entirely naked. A low cutaneous crest extends from between the posterior portions of the eyes almost to the base of the first dorsal spine. Rows of microscopic mucigerous papillæ are present on the snout, around the mouth, across the cheeks and opercles, and on the shoulders. Open pores are present on the interorbital space, above the posterior nostril, around the eye and preoperculum, and above the operculum; these are arranged as shown in the accompanying illustration. Eye of moderate size, superolateral, and broader than the interorbital space, which is flat. Snout obtuse, rounded, a little longer than the eye. Anterior nostril in a short tube overhanging the lip, the posterior a simple opening near the eye. Mouth very oblique, the maxilla extending backward to below the middle of the eye; mandible projecting slightly beyond the upper jaw, the chin rounded, without barbels. Premaxillaries with an outer series of large conical teeth, which decrease in size backwards, and an inner band of villiform teeth, which is broadest anteriorly, and becomes narrower backwards; mandible with a strong curved canine at each angle, between which are some enlarged teeth; an inner band of villiform teeth as in the premaxillaries. Tongue free, thick, and rounded anteriorly. Gill-openings lateral, much wider than the isthmus. Exposed edge of the shoulder-girdle smooth, without papillæ; a pit at its lower angle.

Body compressed, and covered with minute concentrically striated cycloid scales, which are very irregularly arranged; they become ctenoid and increase slightly in size backwards; they extend forward only as far as the shoulder, and leave the breast and the base of the pectoral naked. Vertical series of minute mucigerous pores along the middle of the body represent the lateral line. Genital papilla well developed.

First dorsal originating over the anterior third of the pectorals; the spines are filamentous, and increase in length to the third, which extends backward to the base of the fourth ray when adpressed; the sixth is separated from the others by a wider interspace, and its membrane reaches the base of the first ray. Rays of the second dorsal subequal in height, the hinder ones overlapping the base of the caudal; the margin of the fin is straight. Anal similar to the second dorsal, its rays increasing slightly in length backwards. Pectorals obtusely pointed, the median rays longest, and reaching beyond the vertical of the sixth dorsal spine; no free upper rays. Ventrals inserted before the pectorals, with a deep basal membrane, and reaching nearly two-thirds of their distance from the vent. Caudal obtusely pointed.

*Colour-marking.*—Brown in alcohol, the head and body closely spotted with darker spots, which become linear on the lower portion of the body. Anterior dorsal spines with blackish annuli, their produced portions white; a large dark blotch on the membrane between the third and fifth spines, and some ocelli on the basal half. Second dorsal dusky, with about three irregular rows of dark light-edged ocelli. Anal with dusky streaks between the rays, which are lighter. Caudal and ventral somewhat similar to the anal. Pectoral lighter, with about five transverse lines of dots across the rays.

Described and figured from one of the cotypes, 90 mm. long. Nine other cotypes, 63-92 mm. long, exhibit but little variation.

*Habits.*—An account of the interesting habits of this species is given by one of us in the Proceedings of the Royal Society of Queensland, xxiii., p. 26.

*Locs.*—Port Jackson; Macleay Museum, cotypes of *G. cristatus*, Macleay. Fourteen other specimens, 47-108 mm. long are in the Australian Museum from Port Jackson, Port Hunter, Port Macquarie, and the Richmond River estuary, New South Wales; Caloundra, Queensland.

Genus OXYURICHTHYS, Bleeker.

*Oxyurichthys* (Bleeker), Weber, "Siboga" Exped., lvii., 1913, p. 475.

- a. No orbital tentacle or nuchal crest.....*papuensis*.
- aa. An orbital tentacle and a nuchal crest.....*cornutus*.

OXYURICHTHYS PAPUENSIS, Cuvier & Valenciennes.

*Gobius papuensis*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 106. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 49.

This species has been recorded from Australia by Günther.

OXYURICHTHYS CORNUTUS, McCulloch & Waite.

*Oxyurichthys cornutus*, McCulloch & Waite, Rec. S.Austr. Mus., i. 1, 1918, p. 80, pl. viii., fig. 2.

*Loc.*—Cairns, Queensland.

(GOBIUS) EREMIUS, Zietz.

*Gobius eremius*, Zietz, Rept. Horn. Exped., ii., 1896, p. 180, pl. xvi., fig. 5. *Id.*, McCulloch, Rec. Austr. Mus., xi. 7, 1917, p. 183, pl. xxxi., fig. 1.

*Hab.*—Fresh water, Central Australia.

Subfamily ELEOTRINAE.

Base of the pectoral fin not unusually muscular or mobile. Eyes not erectile. Ventral fins separate.

Provisional key to the Australian genera known to the authors.

- a. Ventral rays i/4.
- b. Body elongate, scales minute; dorsal rays about vi/29.....*Ptereoleotris*.
- bb. Body short, scales large; dorsal rays about vi/9-10.....*Eviota*.
- aa. Ventral rays i/5.
- c. Scales small, more than 50 in a longitudinal row.
- d. Sides of head naked.....*Valenciennaea*.
- dd. Sides of head scaly.
- e. Preoperculum without a spine at the angle.
- f. Body scales cycloid; jaws with large canines.....*Odontoleotris*.

- ff. Body scales ctenoid; jaws without canines.....*Oxyeleotris*.
- ee. Preoperculum with a spine at the angle.....*Eleotris*.
- cc. Scales larger, less than 50 in a longitudinal row.
- g. Top of head with bony crests.....*Butis*.
- gg. Top of head without bony crests.
- h. Preoperculum with 2-3 strong spines.....*Asterropteryx*.
- hh Preoperculum unarmed.
- i. Cheeks and opercles naked.....*Philypnodon*.
- ii. Opercles scaly, cheeks more or less sealy.
- j. Interorbital space sealy.
- k. Snout broad, flat and depressed; scales on upper surface of head enlarged; first dorsal usually with 6 spines.....*Ophiocara*.
- kk. Snout narrower, more convex; scales on upper surface of head not enlarged; first dorsal with 7-9 spines.....*Muguruda*.
- jj. Interorbital space naked.
- l. Scales smaller, 37-40; body moderately elongate.....*Gobiomorphus*.
- ll. Scales larger, 27-35; body deeper.....*Carassius*.

Genus PTERELEOTRIS, Gill.

*Ptereleotris*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 270 (*Eleotris microlepis*, Bleeker). *Id.*, Bleeker, Arch. Néerl., ix., 1874, p. 307.

Body elongate, compressed, covered with minute cycloid scales, which are separate anteriorly; no lateral line. Head naked, short. Eye of moderate size. Mouth moderate, very oblique, the lower jaw projecting; chin without barbels. Teeth in several rows in each jaw, with large canines; palate toothless. Tongue styliform. Gill-openings wide, isthmus narrow, shoulder-girdle smooth. Pseudobranchiae present; gill-rakers long, slender, and numerous. Six dorsal spines and about 29 rays; anal opposite the dorsal, with about 27 rays. Ventrals  $i/4$ . Some of the caudal rays produced. Vertebrae about 26.

PTERELEOTRIS MICROLEPIS, Bleeker.

(Plate xxxvii., fig. 1.)

*Eleotris microlepis*, Bleeker, Nat. Tijdschr. Ned. Indie, xi., 1856, p. 102.

*Id.*, Günther, Cat. Fish. Brit. Mus., iii., 1861, p. 132. *Id.*, Günther & Playfair, Fish. Zanzibar, 1866, p. 75, pl. ix., fig. 5.

*Eleotriodes microlepis*, Bleeker, Nat. Tijdschr. Ned. Indie, xvi., 1858, p. 212.

*Ptereleotris microlepis*, Bleeker, Versl. Akad. Amsterdam (2), xi., 1877, p. 103.

*Eleotris elongata*, Alleyne and Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 335, pl. xiii., fig. 1.

D. vi/29; A. 27; P. 22; V.  $i/4$ ; C. 15. Scales minute. Four branchiostegals. Vertebrae 26, including the hypural.

Depth 7.8 in the length to the hypural; head 5.2 in the same. Eye slightly longer than the snout, 3.7 in the head. Bony interorbital width 1.3 in the eye. Snout 4.2, depth of caudal-peduncle 2 in the head.

Head naked, with preopercular, nuchal, occipital and rostral pores. Eye large, lateral, its margin close to the upper profile of the head. Interocular space rather flat, its width equal to the diameter of the eye. Snout shorter than the eye; nostrils without tubes, on its superolateral angle, the posterior near the orbital margin. Mouth protractile, the cleft very oblique; maxillary pointed posteriorly, and reaching to below the anterior orbital margin. Mandible projecting well beyond the upper jaw; chin without barbels. Teeth in the upper jaw in two series; the outer consists of large, spaced, fang-like canines, the inner of a narrow band of minute teeth. Lower jaw with an inner row of three or four canines on each side, and a group of strong teeth on both sides of the symphysis; between these are some smaller teeth, and a row of small teeth is present on the posterior portion of each side. Palate toothless. Tongue long, styliform, and partly free. Gill-openings wide, the membranes separated on the isthmus by a space which is less than half as wide as the eye. Shoulder-girdle smooth. Pseudobranchiæ present. Gill-rakers on the first arch long, slender, close-set and numerous.

Body covered with minute cycloid scales, which are irregularly arranged, and separate anteriorly but close together posteriorly; they extend forward to above the end of the operculum, and onto the pectoral base and the thorax, leaving the nape naked; posteriorly they cover the caudal base. A minute genital papilla.

First dorsal originating a little in advance of the middle of the pectorals; the spines increase in length to the fifth, which is as long as the head without the operculum, the last spine widely separated from the fifth. Second dorsal elevated, the rays weakly divided; they increase in height to about the eighth, which is four-fifths the length of the head, and thence decrease backwards. Anal commencing well behind the second dorsal, but coterminal with it; the two fins are of similar form. Caudal emarginate, the upper and lower rays produced. Ventrals juxtaposed basally but separate, with a flexible slender spine and four articulated rays the inner of which is the longer and filiform. Pectorals rounded, the median rays longest and reaching to about the vertical of the fifth dorsal spine.

*Colour-marking.*—The only marking remaining is a small, oblique, brown bar on the base of the pectoral fin, the rest of the body and fins being pellucid.

Described and figured from the holotype of *Eleotris elongata*, 93 mm. long, which is in a poor state of preservation. It is clearly the example originally described by Macleay, not only because it is so labelled, but it is the only specimen in his collection having any resemblance to his description and figure; the colour-marking of the pectoral fin also agrees with the latter. It proves his description to be incorrect in the number of dorsal and anal rays, and in the form of the caudal fin, while his figure is inaccurate in most details.

*Synonymy.*—*Eleotris elongata* is evidently synonymous with *Ptereoleotris microlepis*. Macleay's specimen agrees with Bleeker's description of that species in most details, differing only in having somewhat higher dorsal

and anal fins, and in having four instead of five ventral rays; the first character is probably variable, while it seems not unlikely that the number of ventral rays was incorrectly counted by Bleeker.

*Loc.*—Darnley Island, Torres Strait. Perhaps a pelagic form.

Genus *EVIOTA*, *Jenkins*.

*Eviota*, Jenkins, Bull. U.S. Fish. Comm., xxii., 1903, p. 501 (*E. epiphanes*, Jenkins).

*Allogobius*, Waite, Rec. Austr. Mus., v. 3, 1904, p. 176 (*A. viridis*, Waite).

*EVIOTA VIRIDIS*, *Waite*

*Allogobius viridis*, Waite, Rec. Austr. Mus., v. 3, 1904, p. 177, pl. xxiii., fig. 3.

*Eviota zonura*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 386, fig. 75.

*Eviota viridis*, McCulloch, Rec. Austr. Mus., ix. 3, 1913, p. 386.

*Loc.*—Queensland coast between Port Curtis and Torres Strait (McCulloch).

Genus *VALENCIENNEA*, *Bleeker*.

*Valenciennaea*, Bleeker, Nat. Tijd. Ned. Ind., xi., 1856, p. 412 (*Eleotris strigata*, Broussonet). *Id.*, Jordan & Snyder, Proc. U.S. Nat. Mus., xxiv., 1901, p. 42.

*Calleleotris*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 270 (*E. strigata*, Broussonet).

*Valenciennesia*, Bleeker, Versl. Akad. Amsterdam (2), viii., 1874, p. 372—emended spelling.

*Gobiomorus*, Gill, Proc. U.S. Nat. Mus., xi., 1888, p. 69 (*G. taibou*, Lacep.). Not *Gobiomorus*, Lacepède.

Body moderately elongate, a little compressed, covered with small, ctenoid scales. Head naked, opercles unarmed; jaws subequal, with strong, spaced teeth, which are uniserial or biserial anteriorly in the lower jaw, but uniserial elsewhere; a curved canine on each side of the mandible; palate toothless. Isthmus broad. Ventral fins separate, with one spine and five rays. Dorsal fins with six spines and thirteen to nineteen rays, anal similar to the second dorsal.

*Nomenclature*.—Gill (*Loc. cit.*) considered Lacepède's name *Gobiomorus*<sup>18</sup> should be used for this genus, but Jordan<sup>19</sup>, as the first revisor, applied it to *Philyphorus*, and we consider he should be followed.

<sup>18</sup> *Gobiomorus*, Lacepède—Hist. Nat. Poiss., ii., 1800, p. 583.

<sup>19</sup> Jordan—Proc. U.S. Nat. Mus., v., 1883, p. 571.

## Key to the species examined.—

- a.* D. vi/19. Body without marking; a single dark-blue stripe crossing the upper portion of the cheek and operculum.....*strigata*.
- aa.* D. vi/13. Body ornate.
  - b.* Third dorsal spine distinctly longer than the others. Cross-bands and ocelli indefinite or wanting.
    - c.* Cheek and operculum with about nine large ocelli.....*violifera*.
    - cc.* Cheek and operculum banded, without spots.....*muralis*.
  - bb.* Third dorsal spine not, or scarcely longer than the others. Five cross-bands on the trunk, forming distinct, large ocelli on the sides.....*longipinnis*.

Of these species, only *V. muralis* and *V. longipinnis* have been recorded from Australia. Three specimens of *V. strigata*, Broussonet, are in the Australian Museum from the New Hebrides, and twenty-three of *V. violifera*, Jordan & Seale, from Samoa, New Hebrides, Bougainville Island, and Duke of York Island.

VALENCIENNEA MURALIS, *Cuvier & Valenciennes*.

(Plate xxxvii. ; fig. 4).

*Eleotris muralis*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 253, pl. ccclvii. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 130, and Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62. *Id.*, Day, Fish. India, 1876, p. 310, pl. lxix, fig. 1. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 386. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 624.

*Valenciennea muralis*, Jordan & Snyder, Proc. U.S. Nat. Mus., xxiv., 1901, p. 42.

*Eleotriodes muralis*, Bleeker, Nat. Tijd. Ned. Ind., xv., 1858, p. 201.

*Eleotris trabeatus*, Richardson, Icones Piscium, 1843, p. 5, pl. ii. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 105, f. n.

*Eleotris lineata*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 334 (perhaps not *E. lineata*, Castelnau).

*Valenciennea aruensis*, Ogilby, Proc. Roy. Soc. Qld., xxiii., 1910, p. 21.

D. vi/13 ; A. 13 ; P. 20 ; V. i/5 ; C. 13. About 90 series of scales from above the base of the pectoral to the hypural joint; about 32 between the anterior dorsal and anal rays.

Depth 6 in the length to the hypural joint; head 3.5 in the same. Eye 5.5 in the head, and 2 in the snout, which is 3 in the head, and equal to the depth of the caudal peduncle. Interocular space slightly narrower than the eye.

Head naked, with the usual preopercular, nuchal, occipital, and rostral pores; cheeks and opercles without mucigerous systems. Eye rather small, cutting the dorsal profile, and separated by a flat interocular space; bony interorbital about half as wide as the eye. Snout much longer than the eye, a little convex. Mouth oblique, maxillary reaching to below the anterior orbital margin. Lower jaw closing within the upper. Premaxillary teeth in a single series, largest anteriorly and slender, curved and spaced; they form two rows on the anterior part of the mandible, but

are uniserial and smaller laterally, and there is a canine on each side. Palate toothless. Tongue rounded anteriorly. Gill-opening much wider than the base of the pectoral, separated by a broad isthmus. Shoulder-girdle smooth.

Body compressed, the breadth between the pectorals 1·1 in the depth. It is covered with small ctenoid scales, which extend forward to above the end of the operculum and to behind the ventrals, leaving the nape, thorax, and pectoral bases naked. Genital papilla minute.

First dorsal commencing behind the vertical of the pectorals; the third ray projects beyond the others, and is as long as the head without the operculum. The dorsal rays are subequal in height, the last slightly longer than the others, and reaching to the hypural joint. Anal of similar form to the second dorsal, originating behind its second ray, and terminating in advance of its last. Pectoral rounded, the median rays longest, not quite reaching the vertical of the anterior dorsal ray. Ventrals inserted in advance of the pectorals, their third rays longest, reaching a little more than half their distance from the anterior anal ray. Caudal pointed, the median rays 0·1 longer than the head.

*Colour.*—Body generally light coloured, with four longitudinal stripes and some very indefinite cross-bands; the first stripe commences on the nape behind the eyes, and extends along the back to the last dorsal ray; the second begins on the snout, and passing through the eye, is lost below the posterior dorsal rays; the third commences behind the upper lip and extends to the caudal, and the fourth runs from behind the pectoral to the caudal base. Snout and interorbital space with spots and bars. Cheek and operculum with three horizontal, dark-edged stripes, two of which extend onto the pectoral base; no spots or occelli. First dorsal fin with about seven undulous, dark-edged stripes and a large black spot behind the third spine. Second dorsal with some indefinite stripes anteriorly. Caudal with a broad greyish margin, and an oblique, dark-edged stripe near the upper and lower bases.

Described from a specimen 109 mm. long, from Dunk Island, North-east Queensland, and collected by Mr. E. J. Banfield. Six others examined have the same colour-marking, except that they lack all traces of cross-bars on the body.

*Synonymy.*—*Eleotris trabeatus*, described by Richardson from a drawing of a fish from Depuch Island, North-western Australia, is probably synonymous with *V. muralis*; the size of its scales, and the squamation of the head as shown in the figure, are doubtless errors of the amateur artist. The specimen identified by Alleyne and Macleay from Darnley Island as *E. lineata*, Castelnau, is certainly *V. muralis*, as are Macleay's *E. muralis* from the Endeavour River. Three paratypes of *V. aruensis* only differ from the specimen described above in having the cross-bars better defined; they appear to represent a variety of *V. muralis*.

*Locs.*—Dunk Island, North-eastern Queensland; Austr. Mus. Darnley Island, Torres Strait, and Endeavour River, North-east Queensland; Macleay Mus. Aru Islands; Qld. and Austr. Mus. Günther has recorded *V. muralis* from Cape York, and Klunzinger had specimens from Port Darwin, while *Eleotris trabeatus* came from North-western Australia.

*Hab.*—Indian Seas to North Australia, Japan, and the western Pacific.

VALENCIENNEA LONGIPINNIS, *Bennett.*

*Eleotris longipinnis*, Bennett, Voy. "Blossom", Zool., 1839, p. 64, pl. xx., fig. 3. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 105, f. n., and Fische Südsee, vi., 1877, p. 190.

*Valenciennea longipinnis*, Waite, Rec. Austr. Mus., iv., 1902, p. 271, pl. xlivi. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 382.

*Valenciennesia longipinnis*, Bleeker, Versl. Akad. Amsterdam (2), xi., 1877, p. 93.

*Eleotris strigata*, Thiollier, Ann. Agric. Soc. Lyon, viii., 1856, p. 188 (not *E. strigata*, Cuv. & Val.—*fide* Bleeker).

*Eleotris ikeineur* (Montrouzier), Thiollier, *Ibid.*

*Eleotris tenuira*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 624.

D. vi/13; A. 13; P. 21; V. i/5; C. 15. About 112 rows of scales from above the pectoral base to the hypural joint, and about 40 between the anterior dorsal and anal rays.

Depth 5·4 in the length to the hypural joint; head 3·6 in the same. Eye 5·1 in the head, and 1·8 in the snout, which is 2·8 in the head. Interocular space 1·2 in the eye. Depth of caudal peduncle 2·3, fourth dorsal spine 1·3 in the head. Median caudal rays 0·7 longer than the head.

Form and structural details almost exactly similar to those of *V. muralis*, but the anterior dorsal fin is rounded, the third ray being not longer than those on either side of it; the median caudal and posterior dorsal and anal rays are more produced, and the scales appear somewhat smaller.

*Colour*.—Pale brown in formaline, becoming white below, with four narrow longitudinal bands which are similar to, but less distinct than those of *V. muralis*. Nape and back with ten dusky cross-bars; sides with five bands which terminate in large ocelli on the lower longitudinal band. Cheek and operculum with three horizontal blue bars with dark edges, and some large blue spots; snout dusky, with blue bars and spots. First dorsal with about six oblique, dark-edged stripes, and a dusky spot behind the fourth spine. Second dorsal with about four rows of blue ocelli between the rays. Anal with a light, dark-edged band near its base. Caudal with large, inter-radial ocelli and bars, and broad dusky margins. Pectorals and ventrals plain (for the colours of a fresh specimen, see Waite, *Loc. cit.*).

Described from a specimen 170 mm. long. Four others, 80-160 mm. long show some variation in the intensity and extent of their colour-marking, which, however, is similarly arranged in all. They differ from *V. muralis* in having the longitudinal bands less distinct, and in the possession of five well defined cross-bars and ocelli on the sides.

*Synonymy*.—The holotype of *Eleotris tenuira*, Macleay, 117 mm. long, is very faded, but clearly shows the characteristic lateral ocelli and blue bars on the cheeks and opercles. It is certainly identical with the species described above.

*Locs*.—Specimens are in the Australian Museum from Green Island, near Cairns, and Masthead Island, off Port Curtis, Queensland. Macleay's specimen was collected at Low Island, near Cooktown.

*Hab*.—Riu Kiu Islands to the East Indies, Fiji, and Queensland.

VALENCIENNEA LINEATA, *Castelnau.*

*Eleotris lineata*, Castelnau, Res. Fish. Austr. (Viet. Offic. Rec. Philad. Exhib.), 1875, p. 24. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 623—part.

*Eleotris nigrifilis*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 754—substitute name for *E. lineata*, considered to be preoccupied by *Dormitator lineata*, Gill, 1863.

This species is allied to, and probably identical with either *V. muralis* or *V. longipinnis*. Castelnau counted fourteen dorsal and anal rays, as against thirteen in those species, but their posterior rays are so deeply divided that they might each be counted as two. The fourth dorsal spine being longer than the third suggests the identity of *V. lineata* with *V. longipinnis*, but the colour-marking was apparently more like that of *V. muralis*.

Loc.—Cape York (Castelnau).

Genus ODONTELEOTRIS, *Gill.*

*Odonteleotris*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 270 (*Eleotris macrodon*, Bleeker).

Body covered with very small cycloid scales, which extend onto the head to before the eyes, and cover the cheeks and opercles. Cheeks with prominent rows of minute mucigerous papillæ. Snout obtuse, mandible projecting; mouth oblique, rather large. No barbels; anterior nostril in a large tube overhanging the lip. A narrow band of villiform teeth in each jaw, and some enlarged inner ones on the sides; several strong canines in front of each jaw. Tongue rounded and free anteriorly. Gill-openings extending a little forward below, but separated by a wide interspace; exposed edge of shoulder-girdle smooth, with a free dermal membrane. Pseudobranchiæ present; about seven slender gill-rakers on the anterior margin of the first arch. Dorsal fins short, with about vi/11 rays; anal similar to the soft dorsal, with about 9 rays. Pectoral without free rays; ventrals separate, with i/5 rays. Caudal rounded.

ODONTELEOTRIS MACRODON, *Bleeker.*

*Eleotris macrodon*, Bleeker, Verh. Bat. Gen., xxv., 1853, p. 104, pl. ii., fig. 1. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 129. *Id.*, Day, Fish. India, 1876, p. 311, pl. lxv., fig. 3. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 385. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 34.

*Odonteleotris macrodon*, Bleeker, Versl. Akad. Amst. (2), xi., 1877, p. 14.

Loc.—This species has been recognised from Port Darwin by Klunzinger. An example from Dr. Day's collection is in the Australian Museum from Akyab, India.

## Genus OXYELEOTRIS, Bleeker.

*Oxyeleotris*, Bleeker, Arch. Néerl. Sc. Nat., ix., 1874, p. 302.

Bleeker's papers on this genus being unavailable to us, we follow Weber in regarding *Eleotris immaculatus*, Macleay (= *E. lineolatus*, Steindachner) as a species of *Oxyeleotris*. If this be correct, the genus can only be distinguished from *Eleotris* by its different physiognomy and in lacking a preopercular spine.

## OXYELEOTRIS LINEOLATUS, Steindachner.

*Eleotris lineolatus*, Steindachner, Sitzb. Akad. Wiss. Wien, lv. i., 1867, p. 13.

? *Eleotris planiceps*, Macleay, Proc. Linn. Soc. N.S.Wales, vii. i., 1882, p. 69 (not *E. planiceps*, Castelnau, 1878, nor *E. planiceps*, Macleay, 1883).

*Eleotris immaculatus*, Macleay, Proc. Linn. Soc. N.S.Wales, viii. 2, 1883, p. 268.

? *Eleotris selheimi*, Macleay, *Ibid.*, ix. 1, 1884, p. 33—substitute name for *E. planiceps*, preoccupied.

*Eleotris crescents*, De Vis, Proc. Roy. Soc. Qld., ii., 1886, p. 33.

*Eleotris (Oxyeleotris) heterodon*, Weber, Nova Guinea, v. 2, 1908, p. 255, pl. xiii., fig. 7.

D. vi/10; A. 9; P. 17; V. i/5; C. 16. 60 scales between the axil and the hypural joint, and 20 between the anterior dorsal and anal rays.

Depth before the ventrals 5·1 in the length from the premaxillary symphysis to the hypural joint; head, excluding the mandible, 2·8 in the same. Eye 9 in the head, and 1·9 in its distance from the premaxillary symphysis; it is 2·3 in the interorbital space, which is 3·8 in the head. Breadth before the pectoral bases 0·1 greater than the depth; depth of the caudal peduncle 2·5 in the length of the head. Second and third dorsal spines subequal, 2·8 in the head; fourth dorsal ray 2·2, seventh anal ray 2·1 in the head.

Head depressed broader than deep. With the exception of the snout and under surfaces, it is entirely covered with small cycloid scales. The upper surface of the head, cheeks, opercles, and mandible are traversed by numerous series of minute mucigerous papillæ, which are largely hidden among the scales; there is an open pore above the posterior nostril, and several others around the preopercular border. Eye superolateral, much shorter than the snout. Interorbital space broad, nearly flat, and completely covered with minute scales which extend forward to between the posterior nostrils. Preopercular margin entire, the angle without a spine. Snout produced, rounded anteriorly, the mandible projecting far beyond the upper jaw; the posterior processes of the premaxillaries form a protuberance on the snout, which produces a characteristic convexity of the profile anteriorly. Anterior nostril in a

tube overhanging the lip, the posterior a large opening near the upper margin of the eye with skinny edges. Mouth oblique, the maxilla reaching backward to below the posterior fourth of the eye. A broad band of villiform teeth in the premaxillaries, some of which are a little larger than the others near the symphysis, and an outer row of strong conical, but small teeth; mandible with a band of villiform teeth, the inner row of which is a little larger than the others, and an outer row of conical teeth; posteriorly these give place to an inner row of similar teeth which increases in size backwards. Tongue broadly spatulate and free anteriorly, its margin rounded. Gill-openings extending far forward below, the space separating them being narrower than the eye; exposed edge of the shoulder girdle quite smooth.

Body broader than deep anteriorly, becoming compressed posteriorly. It is completely covered with rather small ctenoid scales which are subequal in size on the sides and tail, but are smaller on the nape, breast, and pectoral base; they extend onto the bases of the pectoral and caudal fins between the rays. Genital papilla large.

First dorsal commencing before the middle of the pectoral, its margin rounded; the second and third spines are longest, and the sixth is more widely separated than the others. The second dorsal rays increase slightly in length to the penultimate, which is a little longer than the highest spine; the last is double, and reaches somewhat more than half its distance from the caudal base. Anal almost opposite the second dorsal, and of similar form; the rays increase in height to the seventh. Pectoral rounded, the tenth ray longest but not reaching the vertical of the vent. Ventrals inserted a little before the pectorals, the fourth rays longest, and reaching about two-thirds of their distance from the vent. Caudal rounded.

*Colour*.—Dark brown after long preservation, without definite markings.

Described from the holotype of *Eleotris immaculatus*, 480 mm. long. It proves its original description to be inaccurate in its proportional details, particularly as regards the measurements of the eye and the interorbital space.

*Variation*.—An example 335 mm. long, which is a cotype of *E. crescentis*, De Vis, is quite similar in all its structural details to the specimen described, differing only in some slight proportional measurements which are coincident with its smaller size. Another specimen which is only 181 mm. long, is much lighter in colour, being sandy yellow with grey lines along each row of scales on the back and sides, while the dorsal and caudal fins are mottled with grey spots; it has the following proportions:—Head 2.7 in the length to the hypural joint; depth before the ventrals 5.6 in the same; breadth before the pectoral bases 0.1 greater than the depth; depth of the caudal peduncle 3.3 in the head; eye 8 in the head, and 1.8 in its distance from the premaxillary symphysis; it is 1.9 in the interorbital space, which is 4.1 in the head.

*Synonymy*.—Steindachner's description of *E. lineolatus* from Rockhampton agrees very well with a cotype of *E. crescentis*, De Vis, from the

same locality, and the two are apparently synonymous. The example of *E. crescents* further agrees in all details with the holotype of *E. immaculatus* described above; its palate is perfectly smooth, there being no indication of palatine or vomerine teeth as described by De Vis. The type of *E. planiceps*, Macleay (1882), cannot now be found, and appears to have been lost; its brief description does not enable us to determine its identity, but it is very probably synonymous with *O. lineolatus*. Weber's description and figure of his *O. heterodon* agree very well with the holotype of *O. immaculatus*, and we consider his suggestion as to the probable identity of the two to have been proved correct.

Mr. Robert Archer of Gracemere Station, Rockhampton, informs us that this fish is never seen in the winter; but in summer it lies close to the surface and can be easily caught with a landing-net; it is very sluggish, and he has never known it to take a bait. It is the only fish in the Mere worth eating, having white firm and flaky flesh which is not at all muddy in flavour; all the other species occurring in the Mere are almost uneatable because of their muddy taste.

*Locs.*—We have examined six specimens from the following Queensland localities. Gracemere, and other lagoons near Rockhampton; cotypes of *E. crescents*, De Vis. Double Creek, Upper Dawson River; coll. H. Pearce. Hughenden, Flinders River; coll. F. L. Berney. The holotype of *E. immaculatus* was obtained in the Kéremma River, Gulf of Papua.

Genus *ELEOTRIS*, *Bloch & Schneider*.

*Eleotris*, Gronow, Zoophylaceum, 1763, p. 58 (*Gobius pisonis*, Gmelin)—  
Non-binomial. *Id.*, Bloch & Schneider, Syst. Ichth., 1801, p. 65—  
after Gronow.

*Culius*, Bleeker, Nat Tijd. Ned. Ind., xi., 1856, p. 41 (*Poecilia fusca*,  
Bloch & Schneider).

Body cylindrical anteriorly, compressed posteriorly; scales small and mostly ctenoid, but cycloid on the nape, breast and abdomen. Head with small cycloid scales which extend forward to the posterior nostrils, and cover the cheeks and opercles; they are often hidden in mucous in well preserved specimens and are difficult to detect. Preoperculum with a spine at the angle. Snout, upper surface of the head, cheeks, opercles, and mandible with many rows of microscopic mucigerous papillæ. Snout obtuse, the mandible projecting; mouth oblique. Eye superolateral, the interorbital space wide. Nostrils widely separated, the anterior tubular. No barbels. Each jaw with a band of villiform teeth, and an outer row of stronger ones. Tongue free, slightly rounded anteriorly. Gill-openings continued a little forward below, the isthmus of moderate width; exposed edge of the shoulder-girdle smooth. Pseudobranchiæ present; anterior gill-rakers of the first arch few and thick, about eight on the lower limb. Dorsal fins short, with about vi/9 rays; anal similar to the soft dorsal. Caudal and pectorals rounded; ventrals i/5, widely separated.

This definition is based upon *E. fusca*, Bloch & Schneider.

## ELEOTRIS FUSCA, Bloch &amp; Schneider.

*Poecilia fusca*, Bloch & Schneider, Syst. Ichth., 1801, p. 453.

*Cobitis pacifica*, Forster, in Bloch & Schneider, *Ibid.*, and Deser. Anim. (ed. Lichtenstein), 1844, p. 235.

*Cheilodipterus culius*, Buchanan, Fish. Ganges, 1822, pp. 55, 367, pl. v., fig. 16.

*Eleotris nigra*, Quoy & Gaimard, Voy. "Uranie", Zool., 1824, p. 259, pl. ix., fig. 2. *Id.*, Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, p. 233.

*Eleotris mauritianus*, Bennett, Proc. Comm. Zool. Soc., i., 1831, p. 166.

*Eleotris brachyurus*, Bleeker, Verh. Batav. Gen., xxii., 1849, Blenn. en Gob., p. 20.

*Eleotris melanurus*, Bleeker, *Ibid.*, p. 21.

*Eleotris pseudacanthopomus*, Bleeker, Nat. Tijds. Nederl. Ind., iv., 1853, p. 276.

*Culius niger*, Bleeker, *Ibid.*, xi., 1856, p. 411.

*Culius pseudacanthopomus*, Bleeker, *Ibid.*

*Eleotris incerta*, Blyth, Journ. Asiat. Soc. Bengal, 1860, p. 146.

*Eleotris fusca*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 125, and Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62. *Id.*, Day, Fish. Malabar, 1865, p. 115. *Id.*, Kner, Zool. "Novara," i., Fisch., pt. 2, 1865, p. 186. *Id.*, Playfair, Fish. Zanz., 1866, p. 74. *Id.*, Day, Fish. India, 1876, p. 313, pl. lxv., fig. 7. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 623. *Id.*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxii., 1898, p. 791. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 383.

*Culius fuscus*, Bleeker, Versl. Akad. Amst., xiv., 1862, p. 111, and Arch. Néerl. Sci. Nat., ix., 1874, p. 303. *Id.*, Bleeker, Versl. Akad. Amst. (2), xi., 1877, p. 40.

*Eleotris soaresi*, Playfair, Fish. Zanz., 1866, p. 74, pl. ix., fig. 4.

D. vi/9; A. 9; P. 18; V. i/5; C. 15. 62 scales between the axil and the hypural joint, and 19 between the anterior dorsal and anal rays.

Depth before the ventrals 4·3 in the length from the premaxillary symphysis to the hypural joint; head, without the mandible or the opercular lobe, 3 in the same. Eye 5·5 in the head, a little shorter than the snout, and 1·6 in the interocular space; snout 4·8 in the head. The length of the caudal peduncle is to its depth as 3 is to 2; breadth before the pectoral bases 1·08 in the depth. Third dorsal spine 2·2, and the penultimate dorsal and anal rays 1·6 in the head; pectoral 1·3, and caudal 1·1 in the head.

Head broader than deep, and covered with thick mucous which obscures the scales beneath it; these are present on the cheeks and opercles, and they extend forward to between the eyes on the upper surface of the head. The upper, lateral, and lower surfaces of the head are covered with many intersecting lines of microscopic mucigerous papillæ, which are most abundant around the eye; no enlarged open pores. Preoperculum with a stout antrorse spine at its angle. Eye rather small, superolateral;

interorbital space broad. Snout broadly rounded, its upper profile with a projection before the eyes formed by the posterior processes of the premaxillaries. nostrils widely separated, the anterior in a low tube overhanging the upper lip, the posterior before the superoanterior angle of the eye. Mouth oblique, the maxilla extending to below the posterior portion of the eye; mandible projecting well beyond the upper jaw. Each premaxillary with a band of villiform teeth, the inner rows of which are slightly larger than the others, and an outer row of stronger conical teeth; mandibular teeth similar to those of the premaxillaries anteriorly, but the outer conical teeth are wanting posteriorly, and the inner teeth are enlarged. Tongue free anteriorly, its margin rounded. Gill-opening continued forward to below the preopercular angle, the isthmus much wider than the eye; exposed edge of the shoulder-girdle smooth, with a free dermal membrane.

Body robust, compressed, the dorsal contour a little more arched than the ventral. It is covered with rather small scales, which are mostly ctenoid and of subequal size; they are smaller and cycloid on the nape, breast and abdomen, and on the extreme dorsal and ventral surfaces. Genital papilla large and foliate.

First dorsal originating a little before the middle of the pectoral; it is rounded and low, the longest spine being shorter than its basal length, and just reaching the base of the second dorsal when adpressed. Second dorsal higher than the first, the sixth to eighth rays longest, and the margin feebly rounded. Anal almost opposite, and of similar form to the second dorsal. Pectoral rounded, the middle rays almost reaching the vertical of the anterior dorsal ray. Ventrals inserted below the anterior portion of the pectoral base, the fourth rays longest and reaching about three-fourths of their distance from the vent. Caudal rounded.

*Colour*.—Brown, darker above and lighter below; the sides with indistinct and interrupted series of dark lines along the rows of scales. Several indefinite dark lines radiate backward from the eye, and the upper base of the pectoral bears a dark blotch. First dorsal with a broad white border, the remainder of both fins dusky and ornamented with closely set angular brown markings; the rays of all the other fins are speckled with brown.

Described from a specimen 155 mm. long, from Samoa. It appears to be similar to many others from New Caledonia and the New Hebrides, and apparently differs in only trifling details from an Indian example.

*Locs.*.—Northern Queensland; old collection, Queensland Museum. Oubatche, New Caledonia; coll. C. Hedley. Santo, New Hebrides. Samoa; coll. Professor Jordan, 1902. Calcutta, India; Dr. Day's collection.

**ELEOTRIS OXYCEPHALUS, Temminck & Schlegel.**

*Eleotris oxycephalus*, Temminck & Schlegel, Fauna Japonica, Poiss., 1845, p. 150, pl. lxxvii., fig. 4-5. *Id.*, Kner, Reise "Novara", Zool., i., Fische, 1865, p. 185.

Kner recorded *Eleotris oxycephalus*, Schlegel, from Sydney, but the species certainly does not occur in New South Wales. The localities recorded for many of the "Novara" fishes are known to be incorrect.

The affinities of the following seven species are unknown to us.

(ELEOTRIS) CASTELNAUI, *Macleay.*

*Eleotris obscurus*, Castelnau, Proc. Zool. Soc. Vict., ii., 1873, p. 134 (not of Schlegel).

*Eleotris castelnauui*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 620  
—substitute name.

*Loc.*—Fremantle, West Australia (Castelnau).

(ELEOTRIS) PLANICEPS, *Castelnau.*

*Eleotris planiceps*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1878, p. 49.

*Loc.*—Norman River, Gulf of Carpentaria (Castelnau).

(ELEOTRIS) PALLIDA, *Castelnau.*

*Eleotris pallida*, Castelnau, Res. Fish. Austr. (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 24.

*Loc.*—Cape York (Castelnau).

(ELEOTRIS) MELBOURNENSIS, *Sauvage.*

*Eleotris (Eleotriodes) melbournensis*, Sauvage, Bull. Soc. Philom. (7), iv., 1880, p. 57.

*Loc.*—Melbourne (Sauvage).

(ELEOTRIS) ROBUSTUS, *De Vis.*

*Eleotris robustus*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 692.

*Loc.*—Queensland coast (De Vis).

(ELEOTRIS) SULCATICOLLIS, *Castelnau.*

*Eleotris sulcaticollis*, Castlenau, Proc. Linn. Soc. N.S.Wales, iii., 1878, p. 142.

*Loc.*—Brisbane River (Castelnau).

(ELEOTRIS) STRIATA, *Steindachner.*

*Eleotris striata*, Steindachner, Sitzb. Akad. Wiss. Wien, liii., 1866, p. 452.

Apparently near *Mogurnda adspersa*, but differing, according to the description, in details of the squamation.

*Loc.*—Port Jackson (Steindachner).

## Genus BUTIS, Bleeker.

*Butis*, Bleeker, Nat. Tijdschr. Ned. Ind., xi., 1856, p. 412 (*Eleotris butis*, Buchanan).

Body robust, compressed; head depressed, the snout produced with the mandible projecting. Scales large and angular, with one or more scalelets covering their basal portions; they are everywhere strongly ctenoid, and extend forward to the nostrils and cover the sides of the head. Naked mucigerous canals extend from the snout, around each side of the interorbital area, to the shoulder and around the preopercular border; they are defined by distinct osseous crests. Several open pores are present on the preopercular border. Mouth large, oblique; teeth in a band in each jaw, and either uniformly villiform or with the outer series enlarged. Tongue spatulate, free anteriorly. No barbels. Gill-openings extending well forward below, the isthmus narrow; exposed edge of the shoulder-girdle smooth. Pseudobranchiæ present; anterior gill-rakers of the first arch stout, about six on the lower limb. Dorsal fins short, with about  $vi/9$  rays; anal similar to the second dorsal. Pectorals narrowly rounded, without free rays. Ventrals  $i/5$ , widely separated, the fourth rays longest. Caudal narrowly rounded.

The above definition is based on *B. butis* and *B. amboinensis*.

## BUTIS AMBOINENSIS (Bleeker), Day.

(Plate xxxvi., fig. 4).

*Eleotris amboinensis*, Bleeker, Nat. Tijd. Ned. Ind., v., 1853, p. 343. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 117. *Id.*, Day, Fish. India, 1876, p. 316.

*Eleotris buccata*, Blyth, Journ. Asiat. Soc. Bengal, 1860, p. 145.

*Butis amboinensis*, Bleeker, "Eleotrifomes", 1874, p. 5—*vide* Day.

*Prionobutis buccata*, Bleeker, *Ibid.*,—*vide* Day.

*Eleotris longicauda*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 691.

*Butis longicauda*, Ogilby, Proc. Roy. Soc. Qld., xxiiii., 1910, p. 22.

*Eleotris papa* (De Vis, M. S.) Ogilby, *Ibid.*, p. 24.

*Eleotris butis*, Ramsay & Ogilby, Proc. Linn. Soc. N.S.Wales (2), i., 1886, p. 8 (*not E. butis*, Buchanan).

D.  $vi/9$ ; A. 9; P. 17; V.  $i/5$ ; C. 15. 29 scales between the axil and the hypural joint, and 11 between the anterior dorsal and anal rays.

Depth before the dorsal fin 4·7 in the length to the hypural joint; head 2·8 in the same. Eye 6·1 in the head, and 2·08 in the snout, which is 2·9 in the head. Interorbital space one-third broader than the eye, 1·3 in the snout. Depth of caudal peduncle 2·03 in its length, which is 1·3 in the head. Breadth before the pectorals slightly less than the depth.

Head depressed, much broader than deep; its upper profile slightly concave. Sharp bony ridges are present on the upper surface of the head between the nostrils, surrounding the orbits, above the opercular margins,

and around the preopercular border. Mucigerous canals covered by thin membrane follow these bony ridges, and are perforated along their length by open pores. Scales cover the cheeks and opercles, and all of the snout posterior to the hinder nostril; they are small on the anterior half of the head, larger on the opercles, and bear many minute scalelets on their basal portions. Orbit breaking the upper profile of the head, the eye small and lateral. Interorbital space flat, and scaly to the orbital margins, the scales being subdivided into three series by the bony crests. Snout depressed, somewhat sharply rounded. Nostrils about midway between the eye and the end of the snout, the anterior in a low tube. Mouth a little oblique, the maxilla extending back to about the vertical of the anterior border of the eye. Mandible projecting beyond the upper jaw. Each jaw with a band of villiform teeth, which is broadest anteriorly and narrows backwards; the posterior rows are slightly larger than the anterior ones, and there is an outer row of slightly enlarged conical teeth. Tongue free, broadly spatulate. Gill-openings very wide, extending forward to below the middle of the eye, the membranes united across the isthmus; the latter about as wide as the eye. Exposed edge of shoulder-girdle smooth.

Body subcylindrical anteriorly, compressed posteriorly. It is closely covered with large angular ctenoid scales of almost uniform size, which also cover the breast and base of the pectorals. At the base of each are two or three small scalelets. Genital papilla well developed.

First dorsal originating above the anterior third of the pectoral, rounded; the second spine is longest, about as long as the snout, and the membrane from the last does not nearly reach the second dorsal. The margin of the second dorsal is straight, the second ray longest, and the others decreasing slightly backwards. Anal originating below the third dorsal ray, and terminating behind the last; its rays increase in length backwards. Pectoral rounded, the middle rays reaching the vertical of the first dorsal ray. Ventrals inserted below the hinder half of the operculum, and reaching about two-thirds of their distance from the vent. Caudal broadly rounded.

*Colour-marking.*—Light brown in alcohol, variegated with darker cross-bars, disposed in about five pairs; darker lines extend along the series of scales, and scattered blackish dots are present on the head and body. A broad dark streak extends across the snout to the eye, and is continued backwards across the preoperculum. Anterior dorsal marbled with blackish-brown on a lighter ground colour, and a broad light margin. Second dorsal with oblique rows of dark dots on the rays. Anal dark, with a whitish border; some large white dark-edged ocelli between the rays. Lower portion of the caudal similar to the anal, a broad portion of the upper half and a narrow lower margin white. Ventrals variegated with brown and white, and having a broad white margin. Pectorals light coloured, with a striking quadrangular blackish blotch on a light ground colour at the base of the rays.

Described and figured from a specimen 133 mm. long. Eight others 95-153 mm. long, are similar in all details, varying only in the degree of the development of the colour-marking.

*Identity and Synonymy.*—We have compared these specimens with an example of *B. amboinensis* from the Andaman Islands, which was identified by Dr. Day, and find no difference between them; it must be noted, however, that Day was not certain that his specimens were correctly identified. We have examined the cotypes of *Eleotris longicauda*, De Vis, which are similar to the specimens described above.

*Affinities.*—*B. amboinensis* differs from *B. butis*, with an Indian specimen of which we have compared it, in having a shorter maxilla, and in having the outer row of teeth in each jaw enlarged.

*Locs.*—We have examined specimens from the following localities.—Brisbane River, Queensland. Strickland River, Papua. Ugi, Solomon Islands.

Genus ASTEROPTERIX, *Rüppell.*

*Asteropterix*, Rüppell, Atlas Reise Nordl. Afrika, Fische, 1828, p. 138 (*A. semipunctatus*, Rüppell). *Id.*, Jordan & Evermann, Bull. U.S. Fish. Comm., xxiii. i., 1905, p. 480.

*Brachyeleotris*, Bleeker, Versl. Akad. Amst. (2), viii., 1874, p. 374 (*Eleotris cyanostigma*, Bleeker).

*Priolepis*, Ehrenberg—*fide* Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 305.

ASTEROPTERIX SEMIPUNCTATUS, *Rüppell.*

*Asteropterix semipunctatus*, Rüppell, Atlas Reise Nordl. Afrika, Fische, 1828, p. 138, pl. xxxiv., fig. 4. *Id.*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 385, pl. xxxvi., fig. 1.

*Eleotris cyanostigma*, Bleeker, Nat. Tijd. Ned. Ind., viii., 1855, p. 452. *Id.*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 693. *Id.*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 753.

*Eleotriodes cyanostigma*, Bleeker, Nat. Tijd. Ned. Ind., xv., 1858, p. 460.

*Brachyeleotris cyanostigma*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 306.

*Eleotris semipunctatus*, Günther, Fische Südsee, vi., 1877, p. 187, pl. exi., fig. d.

*Asteropteryx cyanostigma*, Snyder, Bull. U.S. Fish. Comm., xxii., 1904, p. 536.

*Asteropteryx semipunctatus*, Jordan & Evermann, Bull. U.S. Fish Comm., xxiii. i., 1905, p. 480. *Id.*, Ogilby, Mem. Qld. Mus., iii., 1915, p. 125, pl. xxix., fig. 2.

*Locs.*—This species has been recorded from Somerset, Cape York, by De Vis., and from Bowen by Günther.

Genus *PHILYPNODON*, Bleeker.

*Philypnodon*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 301 (*Eleotris nudiceps*, Castelnau). *Id.*, Waite, Rec. Austr. Mus., v. 5, 1904, p. 284.

*Gymnophis*, Bleeker, *Ibid.*, p. 304 (*Eleotris gymnocephalus*, Steindachner).

*Ophiorrhinus*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 745 (*Eleotris grandiceps*, Krefft).

PHILYPNODON NUDICEPS, *Castelnau*.

*Eleotris (Philypnus) nudiceps*, Castelnau, Proc. Zool. Soc. Viet., i., 1872, p. 126.

*Philypnodon nudiceps*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 301.

*Eleotris nudiceps*, Sauvage, Bull. Soc. Philom. (7), iv., 1880, p. 53. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 619.

*Ophiorrhinus nudiceps*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 748.

*Loc.*—Lower Yarra River, Victoria (Castelnau).

PHILYPNODON GRANDICEPS, *Krefft*.

*Eleotris grandiceps*, Krefft, Proc. Zool. Soc., 1864, p. 183. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 618.

*Eleotris gymnocephalus*, Steindachner, Sitzb. Akad. Wiss. Wein, liii., 1866, p. 453, pl. ii., fig. 3. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62.

*Gymnophis gymnocephalus*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 304. *Id.*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, pp. 753, 757.

*Ophiorrhinus grandiceps*, Ogilby, *Loc. cit.*, p. 746.

*Ophiorrhinus angustifrons*, Ogilby, *Loc. cit.*, xxii., 1898, p. 793.

*Philypnodon grandiceps*, Waite, Rec. Austr. Mus., v. 1904, p. 285, pl. xxxvi. fig. 2 (synonymy).

*Hab.*—New South Wales.

Genus *OPHIOCARA*, Gill.

*Ophiocara*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 270 (*Eleotris ophiocephalus*, Cuvier & Valenciennes).

Body robust, compressed, the head large and broad. Scales large, mostly ctenoid on the body and cycloid on the head; there are 28-38 between the axil and the hypural joint, and they extend forward on the upper surface of the head to before the posterior nostrils, and completely cover the cheeks and opercles. Mucigerous canals of the head almost

hidden in the scales; some large open pores on the snout, interorbital space, nuchal groove, and preopercular margin. Eye of moderate size, the interorbital space broad and flat. Snout obtuse, the mandible projecting; no barbels. Each jaw with a band of villiform teeth, and an outer row of stronger ones. Tongue, broad, subtruncate, and free anteriorly. Gill-openings wide, extending well forward below, the space between them either narrow or of moderate width; exposed edge of the shoulder-girdle forming a smooth curved ridge. Pseudobranchiæ present; anterior gill-rakers of the first arch broad and short, about nine on the lower limb. Dorsal and anal fins short, with six spines and about nine rays. Pectoral and caudal rounded; ventrals i/5, widely separated..

Key to the Australian species.

- a. Preopercular margin hidden by the scales; supraciliary scales present.
- b. About 30 scales between the axil and the hypural joint.....*aporos*.
- aa. Preopercular margins exposed and free; no supraciliary scales.
- c. About 37 scales between the axil and the hypural joint.....*darwiniensis*.

OPHIOCARA APOROS, Bleeker.

*Eleotris aporus*, Bleeker, Nat. Tijd. Ned. Ind., vi., 1854, p. 59. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 109. *Id.*, Kner, Reise "Novara", Zool., i., Fisch. 2, 1865, p. 183. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 616.

*Eleotris aporus*, Bleeker, Nederl. Tijd. Dierk., ii., 1865, p. 293. *Id.*, Weber, Nova Guinea, v., 1907, p. 252.

*Ophiocara aporus*, Bleeker, Versl. Akad. Amst. (2), xi., 1877, p. 33.

? *Eleotris porocephalooides*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 384 (not of Bleeker).

*Eleotris planiceps*, Macleay, Proc. Linn. Soc. N.S. Wales, viii., 1883, p. 206 (not of Castelnau, 1878, nor of Macleay, 1882).

*Eleotris aporocephalus*, Macleay, *Ibid.*, ix., 1884, p. 33—substitute name.

*Ophiocara aporus*, Jordan & Seale, Bull. U.S. Fish. Bureau, xxv., 1906, p. 384. *Id.*, Jordan & Richardson, Bull. U.S. Fish. Bureau, xxvii., 1908, p. 274.

D. vi/9; A. 10; P. 14; V. i/5; C. 15. 29 rows of scales between the axil and the hypural joint, and 10 between the anterior dorsal and anal rays.

Depth before the ventrals about 5 in the length from the premaxillary symphysis to the hypural joint; head, without the mandible, 3·2 in the same. Eye 7·1 in the head, and 3 in the interocular space; it is much shorter than the snout. Breadth before the pectoral bases about equal to the depth; the depth of the caudal peduncle is to its length as 2 is to 3.

Head broader than deep, flat above, and almost entirely covered with large cycloid scales; these extend forward almost to the level of the anterior nostrils on the upper surface, and those on the nape have crenulate

margins and are larger than the body scales; there are sixteen rows in front of the first dorsal. A mucigerous canal is present above the eye, which defines a patch of supraciliary scales; two others extend across the cheek, but the remainder, including the parietal groove, are hidden beneath the scales. Preopercular margin not free, almost completely hidden by the scales; an open pore near its angle. Eye rather small, lateral, and situated within the anterior third of the head; it is close to the upper profile. Interorbital space very broad and flat. Snout broadly rounded, with a knob formed by the posterior premaxillary processes; mandible projecting, the symphysis angular. Mouth oblique, the maxilla reaching to below the anterior third of the eye. Nostrils well separated, the anterior in a low tube near the lip, the posterior a simple opening near the eye. Each jaw with a band of villiform teeth, and an outer row of stronger ones. Tongue broad, subtruncate and free anteriorly. Gill-openings extending forward almost to below the middle of the preoperculum, the space separating them wider than the eye. Exposed edge of the shoulder-girdle forming a smooth curved ridge; a sharp angle at its junction with the lower margin of the gill-opening.

Body robust, subcylindrical anteriorly, compressed posteriorly. The scales are large and mostly ctenoid, but are cycloid on the breast and base of the pectoral; they extend up between the bases of the pectoral and caudal rays. Genital papilla large and broadly rounded, with fimbriate edges.

First dorsal commencing above the hinder half of the pectoral, its margin rounded; the third spine is longest but does not reach the second dorsal when adpressed. Second dorsal somewhat rounded, the seventh ray longest, and reaching about two-thirds of its distance from the hypural joint. Anal of similar form to the second dorsal, its origin and termination a little behind those of that fin. Pectoral rounded, the median rays almost reaching the vertical of the interspace between the two dorsals. Ventrals widely separated; the fourth rays longest, and reaching about three-fourths of their distance from the vent. Caudal broadly rounded.

*Colour*.—Brown above, after long preservation, white below. Two dark bars extend obliquely downward from the eye to the operculum, and a third crosses the operculum to the pectoral base; this last has a light patch on its upper portion, and there is a dark bar, followed by a lighter one, at the bases of the rays. The sides of the body have indications of several longitudinal stripes. The fins are dark in colour, and the dorsals, anal, and ventrals have each a broad light margin.

Described from a specimen 284 mm. long, which is one of the cotypes of *Eleotris planiceps*, Macleay (= *E. aporocephalus*, Macleay). It clearly shows the cephalic colour-markings which were said to be wanting by Macleay, but it seems that these dark bars are sometimes more pronounced in old preserved specimens than in those which are fresher.

*Identity*.—We have compared this example with a specimen from the Malay Archipelago, which was received from Dr. F. Day as *O. aporus*, and find the two similar in all details.

*Locs.*—Eleven specimens similar to the example described are in the Australian Museum from the following localities.—Lillesmere Lagoons, Burdekin River; cotypes of *E. planiceps*. Cairns, Queensland. Gazelle Peninsula, New Britain. Solomon Islands. Fiji. Malay Archipelago. Eleven specimens are in the Queensland Museum from the Burdekin River, the Barron River, and Ingham, Queensland.

OPHIOCARA DARWINIENSIS, Macleay.

*Agonostoma darwiniense*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 360, pl. ix., fig. 8.

*Eleotris darwiniensis*, Macleay, *Ibid.*, iv., 1879, pp. 63, 425, and v., 1881, p. 616.

? *Eleotris ophiocephalus*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 384.

*Eleotris ophiocephalus*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 615.

*Eleotris porocephalus*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 755.

D. vi/9; A. 8; P. 16; V. i/5; C. 15. 37 rows of scales between the axil and the hypural joint, and 14 between the anterior dorsal and anal rays.

Depth before the ventrals about 5 in the length from the premaxillary symphysis to the hypural joint; head without the mandible, 4 in the same. Eye 5·2 in the head, and 1·8 in the interorbital space; it is a little shorter than the snout. Breadth before the pectoral bases 1·1 in the depth; depth of the caudal peduncle 1·3 in its length.

Head broader than deep, flat above, and almost entirely covered with scales of moderate size; they extend forward to before the posterior nostrils on the upper surface, and some on the nape are a little larger than the body-scales; some of the scales on the upper surface of the head and cheek are cycloid, but the remainder are ctenoid; there are about twenty-one before the dorsal fin. No distinct mucigerous system above the eye, and no supraciliary scales. Several rows of microscopic mucigerous papillæ extend downward from the eye, and two others cross the cheek horizontally, while further series are present above and behind the preopercular margin, and beneath the mandible. Preopercular margin free and exposed; several large open pores are present around its border, along the parietal groove, and above the nostrils. Eye of moderate size, superolateral, but not cutting the upper profile; it is situated within the anterior half of the head. Interorbital space very broad and flat. Snout broadly rounded, its upper profile scarcely interrupted by a knob formed by the posterior processes of the premaxillaries; mandible projecting, the symphysis rounded. Mouth oblique, the maxilla reaching to below the middle of the eye. Nostrils separated, the anterior tubular and overhanging the lip, the posterior with dermal margins and near the eye. Each jaw with a band of villiform teeth, and an outer row of larger conical ones; in the mandible the outer row is wanting laterally, and is replaced with a row of enlarged inner teeth. Tongue broad, subtruncate and free anteriorly. Gill-openings extending forward to below the hinder margin of the eye,

the space separating them narrower than the eye. Exposed edge of the shoulder-girdle a smooth ridge, and forming an angle at its junction with the lower margin of the gill-opening.

Body robust, subcylindrical anteriorly, compressed posteriorly. The scales are of moderate size, and everywhere ctenoid except on the breast and base of the pectoral; they cover the bases of the pectoral rays, and extend up between those of the caudal. Genital papilla large, subquadrate, its hinder margins fimbriate.

First dorsal rounded, originating above the middle of the pectoral; the third spine is the longest, but does not reach the second dorsal when adpressed. Dorsal rays increasing in length to the penultimate, which reaches three-fourths of its distance from the hypural joint. Anal opposite, and similar in form to the second dorsal. Pectoral rounded, reaching to below the middle of the interspace between the two dorsal fins. Ventrals widely separated, their fourth rays longest and reaching more than two-thirds of their distance from the vent. Caudal broadly rounded.

*Colour-marking.*—Dark brown above after long preservation, light below; the sides bear dark longitudinal stripes between each row of scales, and the central portion of many of the scales is occupied by a light spot. The sides of the head likewise bear a few light spots, but are otherwise uniformly dark in colour. The membrane of the vertical fins is dark between the rays, and the second dorsal and caudal bear numerous pronounced yellowish ocelli in irregular rows; similar ocelli are indicated on the first dorsal, but they are absent from the anal. The margin of the second dorsal, and the upper and lower borders of the caudal are light coloured, while the anal is broadly margined with yellow. Ventrals dusky with lighter margins.

Described from a specimen 187 mm. long, which is one of fifteen cotypes preserved in the Macleay Museum. The others, which range from 43-190 mm. in length, exhibit but little variation in their colour-marking, though the white spots are scarcely developed in the smallest specimens.

*Colour.*—An example 241 mm. long, secured alive by one of us at Cooktown, presented the following colouration. Dorsal surface olive-green, closely vermiculated with dark brown; sides dark blue shot with green, most of the scales with a large greenish-white spot; under surfaces dusky grey, changing to white near the vent. Sides of the head similar to the body, but with fewer and smaller light spots; throat dusky, with large light blotches. First dorsal dusky olive, shot with blue and green. Second dorsal dusky olive below, clearer above, the rays darker; numerous bluish-white spots between the rays forming very irregular rows, and extending high up between the posterior rays; a broad orange margin between the second and seventh rays. Caudal pale blue, the rays dark olive, with numerous greenish-white spots basally; an imperfect orange margin above and below. Anal rich blue and green, the rays darker; a dark submarginal ill-defined band, and a broad orange border. Ventrals blue, the rays olive, with an imperfect yellow margin. Pectoral base without darker markings but with numerous lighter spots; the rays are dusky olive irregularly spotted with black.

*Identity.*—We retain the name *darwiniensis* for this species because we are unable to satisfactorily identify it with any of those described from the East Indian Archipelago. It is very similar to *O. porocephalus*, with representative examples of which we have compared it, but the light dorsal and caudal spots offer a striking contrast to the dark markings of those fins in Cuvier and Valenciennes' species.

We have examined the specimen recorded as *O. ophiocephalus* by Macleay from Rockingham Bay, and find it similar in all details to his cotypes of *O. darwiniensis*. This leads us to suppose that the specimens recorded by Klunzinger under the same name from Port Denison and Port Darwin, also belong to Macleay's species.

This species is deemed a delicacy by the Chinese at Cooktown, Queensland, where it is occasionally secured in large quantities. The fish retains its vitality for some hours after its removal from the water, which is an important factor in its keeping qualities in a hot climate.

*Locs.*—Port Darwin, North Australia; cotypes of the species. Melville Island, North Australia; Queensland Museum. Cooktown, Queensland; coll. McCulloch, June 1918. Rockingham Bay, Queensland; Macleay Museum, as *Eleotris ophiocephalus*.

#### OPHIOCARA MACROLEPIDOTA (Bloch), Günther.

*Eleotris macrolepidotus*, Günther, Fisch. Südsee, vi., 1877, p. 186, pl. cxii., fig. b. *Id.*, Weber, Zool. Forschr. Austr., v., 1895, p. 270. *Id.*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxi., 1897, p. 754.

*Eleotris tumifrons* (Cuvier & Valenciennes), Ogilby, *Ibid.*, p. 755.

Günther identified North Australian specimens as *E. macrolepidotus*, while Weber recorded the species from the Burnett River, Queensland. It is possible that both references are based upon examples of one of the species described above.

#### Genus MOGURNDA, Gill.

*Mogurnda*, Gill, Proc. Acad. Nat. Sci. Philad., 1863, p. 270 (*Eleotris mogurnda*, Richardson). *Id.*, Bleeker, Arch. Néerl. Sci. Nat., ix., 1874, p. 303, and x., 1875, pp. 103, 105.

*Krefftius*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxi., 1897, p. 736 (*Eleotris australis*, Krefft). *Id.*, Waite, Rec. Aust. Mus., v., 1904, p. 281—part.

Body rather robust, compressed, the head large and broad. Scales rather large, mostly ctenoid on the body and cycloid on the head; 30-40 between the pectoral and the hypural joint; they extend forward on the upper surface of the head to between the posterior nostrils, and cover the cheek and operculum. Rows of minute pores extend around the eye, across the cheek, behind the preoperculum and on each side of the mandible. Mouth moderate, oblique, lower jaw projecting; no barbels. A band of villiform teeth in each jaw, palate toothless. Tongue broad,

rounded anteriorly and largely free. Gill-openings separated by a wide isthmus, the membranes extending forward, but not united across it. Exposed edge of the shoulder-girdle forming a smooth, curved ridge. Pseudobranchia present; gill-rakers of first gill-arch short and spaced, about eight on the lower limb. Dorsal with 7-9 spines, and 9-14 rays, anal with 9-14 rays. Ventrals separate, with  $1/5$  rays. Caudal rounded.

*Affinities.*—This genus is very similar to *Ophiocara*, Gill, from which it differs principally in its physiognomy. The squamation of the upper surface of the head is very different in typical forms of the two genera, while the first dorsal has usually six spines in *Ophiocara* and seven to nine in *Mogurnda*, but some species exhibit intermediate characters between these extremes. *Odontobutis*, Bleeker, is also closely allied to *Mogurnda*, but has only a narrow isthmus separating the gill-openings, over which the membranes are narrowly united.

Key to species.—

- a. Dorsal with 11-13 rays, body spotted. Vertebrae 31.....Subgenus *Mogurnda*.
- b. 37-42 scales between the axil and the hypural joint.....subspecies *mogurnda*.
- bb. 30-35 scales between the axil and the hypural joint.....subspecies *adspersus*.
- aa. Dorsal with 9 rays, body striped. Vertebrae 28.....Subgenus *Krefftius*.
- c. 31-33 scales between the axil and the hypural joint.....*australis*.

MOGURNDA MOGURNDA, *Richardson*.

*Eleotris mogurnda*, Richardson, Ichth. "Erebus & Terror", 1844, p. 4, pl. ii., fig. 1-2. *Id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 111. *Id.*, Castelnau, Proc. Zool. Soc. Viet., ii., 1873, p. 85, and Res. Fish. Austr. (Viet. Offic. Rec. Philad. Exhib.), 1875, p. 23. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 384. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 617.

?*Eleotris mogurnda*, Weber, Nova Guinea, v., 1903, p. 253, and Abhandl. Senckenb. Naturforsch. Gesellsch., xxxiv., 1911, p. 34, pl. i., fig. 2.

*Eleotris larapinta*, Zeitz, Rept. Horn Sci. Exp. C. Aust., ii., 1896, p. 179, pl. xvi., fig. 4.

D. viii/13; A. 12; P. 16; V.  $1/5$ ; C. 15. 41-42 rows of scales between the axil and the hypural joint, and 16 between the anterior dorsal and anal rays.

Depth at ventrals 3.5 in the length between the premaxillary symphysis and the hypural joint; head 3.2 in the same. Eye 5 in the head, shorter than the snout, which is 4.2 in the head; interocular width almost twice as wide as the eye, 2.7 in the head. Breadth between the bases of the pectorals 1.4 in the depth; depth of caudal peduncle 2 in the head. Sixth dorsal spine 2.7, last dorsal ray 1.5, and last anal ray 2.1 in the head. Pectoral 1.7, caudal 1.3 in the head.

Head largely covered with cycloid scales, which extend forward to between the posterior nostrils above, and cover the cheek and operculum; snout and mandible naked. Rows of minute pores extend from above the

nostrils, over and behind the eye, to the groove above the opercles; others cross the cheek and operculum, and extend around the preopercular margin and onto the mandible; no large open pores. Eyes separated by a broad, flat, interorbital space; some small imperfect scales on the upper part of the eye. Snout broadly rounded, the mandible projecting. Mouth oblique, the maxilla reaching to below the anterior third of the eye. Anterior nostril in a short tube near the lip, the posterior a simple opening on the upper surface of the head. A broad band of villiform teeth in each jaw, palate toothless. Tongue rounded anteriorly, and largely free. Gill-openings lateral, and continued somewhat forward below, the isthmus separating them wider than the eye. Exposed edge of the shoulder-girdle smooth.

Body robust, compressed posteriorly, covered with ctenoid scales, which extend over the breast and bases of the pectorals. They are a little larger posteriorly than anteriorly. Genital papilla well developed.

First dorsal fin rather low, rounded, and commencing well behind the pectoral base; the penultimate spine is longest, and reaches beyond the first ray when adpressed. Second dorsal oblong, pointed posteriorly, the margin straight; the penultimate ray is longest, and reaches the vertical of the hypural joint. Anal opposite the second dorsal, and similar in form though a little more rounded anteriorly. Pectoral rounded, the median rays longest, and almost reaching the vertical of the last dorsal spine. Ventral inserted below the pectoral-base, the fourth ray longest, and reaching about two-thirds of its distance from the vent. Caudal broadly rounded.

*Colour-marking.*—Light brown in alcohol, with numerous darker spots along the middle of the sides, which coalesce posteriorly into two longitudinal lines enclosing large darker and lighter blotches. Two oblique stripes cross the cheek from the eye, and are continued across the operculum; a third crosses the operculum and the base of the pectoral to a dark blotch on the bases of the rays. First dorsal dusky, with some obscure darker spots, and a white border. Second dorsal dusky, with a white border and numerous large darker spots near the base and on the posterior rays, where they mingle with some lighter markings. Anal with markings similar to those of the second dorsal. Caudal with dark spots between the rays on its median portion, which are largest near the base.

Described from an adult specimen 120 mm. long, from Port Essington, which is somewhat faded, but exhibits all the characters of the species.

*Identity.*—This specimen, and the others referred to below, differ from Richardson's description of *E. mogurnda*, also from Port Essington, in having fewer rays in the dorsal and anal fins, but it must be noted that Günther later re-examined the types and found them constructed as in our specimens. Günther counted forty-eight scales in a longitudinal series, which is a larger number than we find in any of ours.

*Variation.*—Three specimens, also from Port Essington, 25-42 mm. long without the caudal fin, exhibit some variation in the number of fin-rays and scales; D. viii-ix/12-13; A. 12; 38-40 scales between the

axil and the hypural joint, and 15-16 between the anterior dorsal and anal rays. In other specimens the number of anal rays varies from 11-14.

*Synonymy.*—Three examples, 45-63 mm. long, from Red Bank Creek, Central Australia, and received for examination from the South Australian Museum, are topotypes, and possibly cotypes of *Eleotris larapinto*, Zietz. They differ from the description of that species in having the maxilla extending to or beyond the anterior ocular margin instead of nearly to it as described, and the eye is more instead of less than half the interocular width; D. viii/12; A. 11-12; 38-39 scales between the axil and the hypural joint. Others from the Finke River, Central Australia, are similar, and have D. viii-ix/13; A. 11-12; 40 scales between the axil and the hypural joint. These specimens are quite similar to the larger example described above as *M. mogurnda*.

The specimen beautifully figured in colour by Weber from the Aru Islands is very probably correctly identified as *M. mogurnda*, but his illustration shows sixteen dorsal rays, which is more than we find in any of our examples.

*Localities.*—We have examined nineteen specimens from the following localities, Port Essington, Port Darwin, Catherine Mines and Yam Creek in the Northern Territory. Euraka Creek, Walsh River, Northern Queensland. Red Bank Creek and the Finke River, Central Australia.

*Distribution.*—North and Central Australia. ?Aru Islands, and the western and southern coasts of New Guinea (Weber).

MOGURNDA MOGURNDA, *Richardson*.

Subspecies *adspersus*, *Castelnau*.

*Eleotris adspersus*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1878, p. 142. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 622.

*Id.*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 752.

*Eleotris mimus*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 690.

*Id.*, Ogilby, *Loc. cit.*, p. 754.

*Eleotris concolor*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 692.

*Krefftius adspersus*, Ogilby, *Loc. cit.*, xxiii., 1898, p. 789. *Id.*, Waite, Rec.

Austr. Mus., v., 1904, p. 282, pl. xxv., fig. 1. *Id.*, Ogilby, Proc. Roy. Soc. Qld., xxi., 1908, p. 98.

*Eleotris mogurnda*, Bleeker, Nederl. Tijdschr. Dierk., ii., 1865, p. 71. *Id.*, Steindachner, Sitzb. Akad. Wiss. Wien, lvi. i., 1867, p. 326. *Id.*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1879, p. 353. *Id.*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 36 (part). (Not *E. mogurnda*, Rich.)

*Mogurnda mogurnda*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 757. *Id.*, Waite, Rec. Anstr. Mus., v., 1904, p. 282, and Mem. N.S. Wales Nat. Club, ii., 1904, p. 45.

D. vi-ix/11-14; A. 11-14; P. 15-16; V. i/5; C. 15. 30-35 scales between the axil and the hypural joint, and 12-14 between the anterior dorsal and anal rays.

Proportions of a specimen 112 mm. long, from Bundaberg, Queensland, figured by Waite (*Loc. cit.*). Depth at ventrals 3·9 in the length between the premaxillary symphysis and the hypural joint; head 3·1 in the same. Eye 5·6 in the head, shorter than the snout, which is 4·6 in the head; interocular space twice as wide as the eye, 2·8 in the head. Breadth between the bases of the pectorals 1·3 in the depth; depth of caudal peduncle 2·1 in the head. Sixth dorsal spine 3·1, last dorsal ray 1·4, last anal ray 1·6 in the head. Pectoral 1·4, caudal 1·1 in the head.

This specimen agrees with the foregoing description of *M. mogurnda* in all details, except in having the dorsal spines somewhat shorter, and the rays of the pectoral and ventral fins longer, which are merely individual peculiarities.

The subspecies *M. m. adspersus* differs from the typical form only in having larger and less numerous scales, there being 30-35 in a longitudinal series instead of 38-42, and 13-14 in a transverse row instead of 15-16; the two are similar in all other details. But we have examined several specimens from Powell's Creek and the Palmer River, Central Australia, and inland from Cairns, Queensland, in which the scales number 35-36 in a longitudinal series, and 14-16 transversely. These localities are somewhat intermediate between the ranges of the two subspecies, so we are led to the conclusion that the larger and smaller scaled forms are merely geographical races of the one species.

*Synonymy.*—Five cotypes of *Eleotris mimus*, De Vis, preserved in the Australian Museum, prove this species to be synonymous with *M. m. adspersus*, as has already been determined by Ogilby. The holotype of *Eleotris concolor*, De Vis, is in the collection of the Queensland Museum; it is stuffed and its fins are much damaged, while it retains no traces of its colour-marking; its remaining characters, however, leave no doubt as to its identity with *M. m. adspersus*.

*Locs.*—We have examined a representative series of 86 specimens from the following localities. South Australia:—Torrens River; Onkaparinga; Murray Bridge. New South Wales:—near Mudgee and Dubbo; Clarence River. Queensland:—Brisbane River (cotypes of *E. mimus*, De Vis.); Eidsvold, Burnett River; Bundaberg; 25 miles inland from Cairns.

*Distribution.*—South Australia. Murray River System. Rivers of north eastern New South Wales and eastern Queensland, northward to Cairns.

#### MOGURNDÆ (KREFFTIIUS) AUSTRALIS, Krefft.

*Eleotris australis*, Krefft, Proc. Zool. Soc., 1864, p. 183. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 61. *Id.*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1879, p. 384. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 617.

*Krefftius australis*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 737. *Id.*, Waite, Rec. Austr. Mus., v., 1904, p. 283, pl. xxxv., fig. 2.

*Hab.*—Eastern rivers of New South Wales.

Genus GOBIOMORPHUS, *Gill.*

*Gobiomorphus*, *Gill*, Proc. Acad. Nat. Sci. Philad., 1863, p. 270 (*Eleotris gobioides*, *Cuvier & Valenciennes*).

*Mulgou*, *Ogilby*, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 740 (*Eleotris coxii*, *Krefft*).

Body subcylindrical anteriorly, compressed posteriorly; caudal peduncle about half as long as broad. Scales of moderate size, mostly ctenoid but becoming cycloid anteriorly and on the abdomen; they extend forward to between the posterior orbital margins. Head about as broad as deep, snout obtusely conical; mandible projecting. Operculum covered with small scales; cheeks with somewhat rudimentary scales which are most plentiful on the postorbital portions. Lines of minute mucigerous papillæ extend across the cheeks and opercles, around the preopercular margin, and from each side of the snout to above the eye. A broad band of villiform teeth in each jaw; no enlarged outer row. Tongue free and rounded anteriorly. Gill-openings extending forward below, separated by a rather broad isthmus; exposed edge of the shoulder-girdle forming a smooth ridge, with a pit at its lower angle. Pseudobranchiæ present; gill-rakers short and thick, about nine on the lower limb of the first arch. First dorsal rounded, with six to seven spines; second dorsal short, with nine to eleven rays. Pectoral and caudal rounded. Ventrals i/5, completely separated.

*Synonymy*.—A comparison of the genotypes *G. gobioides* and *M. coxii* shows that they are similar in all the above characters. Waite<sup>20</sup> has united *Mulgou* with *Krefftius*, but it is distinguished from that genus in having the interorbital space naked instead of scaly.

Jordan and Evermann<sup>21</sup> have united their genus *Quisquilius* with *Gobiomorphus*, but it differs in the character of its dentition. It has an enlarged outer row of teeth in each jaw, and there is a subcaniniform tooth on each side of the mandible; in *Gobiomorphus* the teeth are subequal in size.

*Hab.*.—Fresh waters and estuaries of New Zealand and New South Wales.

GOBIOMORPHUS COXII, *Krefft.*

*Eleotris coxii*, *Krefft*, Proc. Zool. Soc., 1864, p. 183. *Id.*, *Günther*, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62. *Id.*, *Macleay*, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 618.

*Eleotris richardsonii*, *Steindachner*, Sitzb. Akad. Wiss. Wien, liii., 1866, p. 455, pl. ii., fig. 4.

*Eleotris mastersii*, *Macleay*, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 622.

*Mulgou coxii*, *Ogilby*, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 741.

*Krefftius coxii*, *Waite*, Rec. Austr. Mus., v.5, 1904, p. 283, pl. xxxvi., fig. 1.

<sup>20</sup> *Waite*—Rec. Austr. Mus., v. 5, 1904, p. 281.

<sup>21</sup> *Jordan & Evermann*—Bull. U. S. Fish. Comm., xxiii. i., 1905, p. 483.

*Hab.*—Eastern rivers of southern New South Wales.

*Gobiomorphus gobiooides*, Cuvier & Valenciennes, has been wrongly recorded from Port Jackson by Steindachner<sup>22</sup>, who probably had specimens of the foregoing species before him. *G. gobiooides* is confined to New Zealand rivers and estuaries.

Genus CARASSIOPS, *Ogilby*.

*Carasssiops*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 732 (*Eleotris compressus*, Krefft).

*Austrogobio*, Ogilby, Loc. cit., xxii., 1898, p. 785 (*Carasssiops galii*, Ogilby).

Body compressed, deep or rather slender; head small, compressed. Scales large, ctenoid, about 28-35 between the base of the pectoral and the hypural joint; they extend forward to between the hinder margins of the eyes, but leave the interorbital space naked, and cover the cheek and operculum. Rows of minute pores extend around the eye, across the cheek, behind the preoperculum, and on each side of the mandible. Mouth rather small, oblique, lower jaw longest; no barbels. A band of villiform teeth in each jaw, palate toothless. Tongue broad, subtruncate or rounded anteriorly, and largely free. Gill-openings separated by a rather narrow isthmus, the membranes not united across it. Exposed edge of shoulder girdle a smooth, curved ridge. Pseudobranchiæ present; about eleven gill-rakers on the lower limb of the first arch, which are stout and longer posteriorly, becoming tubercular anteriorly. D. v-viii/10-13; A. 10-14; V. i/5. Caudal rounded.

*Affinities*.—This genus is scarcely distinct from *Hypseleotris*, Gill, apparently differing principally in having the interorbital space and snout naked instead of scaly.

- a. Second dorsal with 9-10 rays; vertebrae 24-25.....Subgenus *Carasssiops*.
- b. D. vi-vii/9-10, A. 10-11; sc. long. 27-29.....*compressus*.
- aa. Second dorsal with 11-14 rays; vertebrae 30-31.....Subgenus *Austrogobio*.
- c. Medio-lateral series of scales without dark markings.....*galii*.
- cc. Each medio-lateral scale with a dark vertical basal bar.....*klunzingeri*.

CARASSIOPS COMPRESSUS, *Krefft*.

*Eleotris compressus*, Krefft, Proc. Zool. Soc., 1864, p. 184. *Id.*, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 62. *Id.*, O'Shaughnessy, Ann. Mag. Nat. Hist. (4), xv., 1875, p. 147. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 619. *Id.*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 36.

*Eleotris brevirostris*, Steindachner, Sitzb. Akad. Wiss. Wien, lvi., 1867, p. 314.

*Eleotris compressus*, Macleay, Proc. Linn. Soc. N.S.Wales, ii., 1878, p. 358, pl. ix., fig. 7.

<sup>22</sup> Steindachner—Sitzb. Akad. Wiss. Wien, lvi. i., 1867, p. 326.

*Eleotris reticulatus*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 388, pl. iv., fig. 3. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 33.

*Eleotris elevata*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 622; (substitute name for *E. compressus*, Macleay, *nec.* Krefft).

*Eleotris humilis*, De Vis, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 690.

*Eleotris cavifrons*, De Vis, *Ibid.*, p. 693 (not *E. cavifrons*, Blyth).

*Eleotris devisi*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 753; (substitute name for *E. cavifrons*, de Vis, *nec.* Blyth).

*Carassius compressus*, Ogilby, *Ibid.*, p. 735. *Id.*, Waite, Rec. Austr. Mus., v., 1904, p. 280, pl. xxxiv., fig. 1.

*Carassius longi*, Ogilby, *Ibid.*, p. 733.

*Carassius compressus montanus*, Ogilby, Proc. Roy. Soc. Qld., xx., 1907, p. 28.

*Hypseleotris compressus*, Cockerell, Mem. Qld. Mus., ii, 1913, p. 59.

D. vi/10; A. 11; P. 15; V. i/5; C. 15. Twenty-eight scales between the upper base of the pectoral and the hypural joint, and nine between the anterior dorsal and anal rays.

Depth at ventrals 3·2 in the length to the hypural joint; head 3·6 in the same. Eye 4·2 in the head, and 1·3 in the interorbital space; snout 1·2 in the eye. Fourth dorsal spine 1·7, penultimate dorsal ray 1·1, and penultimate anal ray 1·4 in the head. Breadth at bases of pectorals 1·9 in the depth. Depth of the caudal peduncle 1·7 in the distance between the last dorsal ray and the hypural joint, and 1·8 in the head.

Cheek and operculum covered with large scales, which are arranged in about four rows on the cheeks. Rows of minute pores surround the eyes, and extend across the cheeks and opercles, around the preopercular border, and on each side of the mandible. Interorbital space naked, almost flat. Anterior nostril in a short tube near the lip, the posterior a simple opening near the upper margin of the eye. Mouth oblique, the maxilla not nearly reaching the vertical of the anterior ocular margin; mandible projecting. A broad band of villiform teeth in each jaw, palate toothless. Tongue apparently truncate anteriorly, or slightly emarginate. Gill-openings broad, separated by a rather narrow interspace. Exposed edge of shoulder girdle forming a curved, smooth ridge.

Body compressed, elevated, and covered with large ctenoid scales, which extend forward to the level of the eyes, there being about fifteen rows before the first dorsal; they are largest on the middle of the sides, and smallest on the breast and base of the pectoral. A large genital papilla, which is broad and truncate posteriorly with its lateral angles slightly produced.

First dorsal spine inserted above the end of the first third of the pectorals; the spines increase in length to the fourth, and the dorsal rays increase in length to the penultimate, which extends three-fourths of its distance from the hypural. Anal opposite and similar to the second dorsal. Pectoral rounded, not quite reaching the vertical of the first dorsal ray. Ventrals inserted below the base of the pectorals; the fourth ray longest, filamentous, and reaching the ventral. Caudal damaged.

*Colour-marking*.—Body completely bleached after long preservation in alcohol. The spines of the first dorsal dark towards the tip; second dorsal with some large light spots near the base and on the posterior rays. Caudal with some obscure darker spots. For details of the colour-marking of fresh specimens, see Ogilby<sup>23</sup> and Waite<sup>24</sup>.

Described from a specimen 87 mm. long, from the Clarence River, which is believed to be one of Krefft's typical specimens. Its history is incomplete, but it tallies with the original description.

*Sexual dimorphism*.—Two examples in the Macleay Museum from the Tweed River, 66-67 mm. long, exhibit sexual dimorphism similar to that which we have described and figured under *C. klunzingeri*. In the larger example the space between the snout and the dorsal fin is greatly swollen, the profile forming a very convex curve; in the smaller specimen these parts are normal. They agree in all other details of both form and colour-marking, and are clearly identical with *C. compressus*.

*Variation*.—Nineteen specimens from several localities, indicate that this species varies considerably both in its general form and colour-marking. Adults of about the same size from Jervis Bay and Port Darwin have the depth at the ventrals 4·6 (*C. longi*) and 3·3 (*C. elevatus*) respectively, but others are more or less intermediate between these extremes. The number of fin rays and spines, and the scales, vary as follows: D. vi-vii/9-10; A. 10-12; Sc. long. 27-30; Sc. tr. 9. The striking colour-marking of the vertical fins as described and figured by Ogilby and Waite is characteristic of adult specimens in breeding condition, and it is apparently more or less developed in all fresh examples, but may be indistinct in specimens in alcohol. Variation similar to the foregoing was noted by Günther in 1867.

*Synonymy*.—The variation in form of this species has caused several authors to bestow a number of names upon it.

The identity of *Eleotris brevirostris*, Steindachner, and *C. compressus*, Krefft, was recognised by O'Shaughnessy in 1875.

Though differing from its description in several important details, the specimen in the Macleay Museum labelled as *Eleotris elevatus* from Port Darwin, is evidently that on which Macleay founded the species. It agrees well with his crude figure, and is structurally similar to *C. compressus*, and exhibits traces of the characteristic markings of that species. It has the following characters. D. vi/8?, both fins imperfect; A. 10; twenty-eight rows of scales between the upper base of the pectoral and the hypural joint, and nine between the anterior dorsal and anal rays. Depth at ventrals 3·3 in the length to the hypural joint, head 3·5 in the same. Eye equal to the length of the snout, 4·6 in the head, and 1·6 in the interocular space.

*Eleotris reticulatus*, Klunzinger, also from Port Darwin, is evidently based on a rather slender, and imperfectly marked example of *C. compressus*.

<sup>23</sup> Ogilby—Proc. Linn. Soc. N.S.Wales, xxi., 1897, p. 733.

<sup>24</sup> Waite—Rec. Austr. Mus., v., 1904, p. 280, pl. xxxiv., fig. 1.

Three cotypes of *Eleotris humilis*, De Vis, 61-93 mm. long, are, as already noted by Waite, similar to the narrow form of *C. compressus*. D. vi/10-11; A. 11; Sc. longt. 28-29; Sc. tr. 9. Depth 3·8-4 in the length to the hypural joint, and subequal to the length of the head.

As noted by Waite, there is nothing in the description of *Eleotris cavifrons*, De Vis (nec. Blyth) to distinguish it from *C. compressus*. The substitute name *E. derisi*, Ogilby, is therefore unnecessary.

*Curassius longi*, Ogilby, is, as recognised by Waite, an elongate variety of *C. compressus*; that its slender form is not of even subspecific value is proved by the fact that some specimens secured in the same locality as the types, are as broad as those from more northern localities.

The name *C. compressus montanus*, Ogilby, was proposed for slender specimens from Killarney, Queensland, which were similar to the typical form in all structural details.

*Locs.*—We have examined specimens from the following localities.— Clarence River, New South Wales; cotype of *Eleotris compressus*, Krefft? Tweed River, New South Wales; Macleay Museum. Liverpool and Marrickville, near Sydney. Jervis Bay, New South Wales; specimen figured by Waite. Brisbane River, Queensland; cotypes of *E. humilis*, De Vis. Mary River, Queensland. Port Darwin, North Australia; holotype of *E. elevatus*, Macleay.

*Distribution.*—Eastern waters of Australia from Cape York to Jervis Bay. Headwaters of the Condamine River, Queensland. Port Darwin.

The following species are probably related to, and possibly identical with *C. compressus*.

*Eleotris modesta*, Castelnau, Proc. Zool. Soc. Viet., ii., 1873, p. 85. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 620.

D. vi/9; A. 10; P. 17; V. i/5; C. 15. Sc. long. 31; sc. tr. 11. Depth a little more than 4 in the length without the caudal, head  $3\frac{1}{2}$  in the same. Eye  $3\frac{1}{2}$  in the head, longer than the snout. Breadth of the snout before the eyes equal to the distance between its extremity and the first third of the eye.

Snout rather depressed, not broad. Mouth oblique, the maxilla not reaching the vertical of the anterior ocular margin. Head entirely scaly; body scales large, ctenoid and striated. Dorsal spines somewhat filamentous. Ventrals long, inserted below the pectorals. Pectorals not longer than the ventrals.

General colour light yellow, brownish above. A small dark shoulder spot, and a faint dark line along the side to the tail. Some irregular oblique transverse spots on the dorsal fins, the extremity of the second black. Caudal transversely speckled with brown.

*Length.*—Two inches.

This species apparently resembles *E. reticulatus*, Klunzinger, from the same locality, which we regard as synonymous with *C. compressus*.

*Loc.*—Port Darwin.

*Eleotris simplex*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1878, p. 49.  
*Id.*, Macleay, *Ibid.*, v., 1881, p. 621.

D. vi/11; A. 11. Sc. longt. 28. Depth 4 in the length without the caudal, and equal to the length of the head. Eye longer than the snout.

Snout short, depressed, flat above. Mouth oblique, maxilla not reaching the vertical of the anterior ocular margin. Head, excepting the snout, scaly; body scales large, ctenoid, and striated. Posterior dorsal rays produced, extending beyond the base of the caudal. Anal similar to the second dorsal. Caudal pointed.

General colour yellow, the dorsal, anal and caudal fins marbled with brown.

*Length*.—Three inches.

All the characters noted in Castelnau's description of this species, with the exception of that relating to the posterior dorsal rays, agree with those of *C. compressus*.

*Loc.*—Norman River, Queensland.

CARASSIOPS (AUSTROGOBIO) GALII, *Ogilby*.

*Carassiosps (Austrogobio) galii*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxii. 4, 1898, p. 788.

*Carassiosps galii*, Waite, Rec. Austr. Mus., v., 1904, p. 281, pl. xxxiv., fig. 2.

*Austrogobio galii*, Ogilby, Proc. Roy. Soc. Qld., xx., 1907, p. 29.

This species has been described in detail by Ogilby, and figured by Waite. It is very similar to some varieties of *C. klunzingeri*; the predorsal scales, however, are usually larger and regular, and the dark markings on the mediolateral scales, characteristic of *C. klunzingeri*, are either indistinct or wanting.

*Locs.*—*C. galii* is common in south-eastern Queensland, and we have examined numerous specimens from near Brisbane. Others are in the Australian Museum from Bundaberg, Queensland. The species has been introduced into a pond in the Botanic Gardens, Sydney, whence the specimens described and figured by Ogilby and Waite were obtained.

CARASSIOPS (AUSTROGOBIO) KLUNZINGERI, *Ogilby*.

(Plate xxxvii.; figs. 2-3.)

*Eleotris cyprinoides*, Klunzinger, Arch. Naturg., xxxviii. i., 1872, p. 31, and Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 384, pl. v., fig. 2. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, ix., 1884, p. 33. *Id.*, Lucas, Proc. Roy. Soc. Vict. (2), ii., 1890, p. 29. *Id.*, Weber, Zool. Forschr. Austr., v., 1895, p. 270 (not *E. cyprinoides*, Cuv. & Val.).

(*Carassiosps*) *klunzingeri*, Ogilby, Proc. Linn. Soc. N.S.Wales, xxii., 1898, p. 787 (not *Eleotris klunzingerii*, Pfeffer).

D. vii-viii/11-13 (12-14); A. 11-14 (12-15); P. 15; V. i/5-6; C. 15. 32-35 scales from above the pectoral base to the hypural joint, and 11 between the anterior dorsal and anal rays.

Depth at ventral fins 3·8-4·3 in the length to the hypural joint; head 3·4-3·6 in the same. Eye 3·4-3·8 in the head, subequal to or slightly narrower than the interocular space. Snout 1·1-1·2 in the eye. Depth of the caudal peduncle 2·7 in the head; its length from the last dorsal ray to the hypural joint is slightly shorter than the head in the male, and a little longer than it in the female.

Cheeks with rudimentary scales, operculum scaly. Numerous rows of minute pores are present on the cheek, operculum and snout, and surrounding the eye, preoperculum and mandible; no larger pores. Eye of moderate size, a little longer than the snout. Nostrils large, simple openings, the anterior near the lip, the posterior near the orbital margin. Teeth microscopic, villiform, in a band in each jaw. Tongue rounded anteriorly. Gill-openings wide, the space between the membranes about as wide as the eye. Inner margin of the shoulder-girdle smooth.

Body moderately compressed, covered with ctenoid scales, which extend forward to behind the eye, onto the base of the pectoral fin, and the thorax; they are small and irregular on the nape, but become larger backwards. Genital papilla large in both sexes. Vertebrae 31, including the hypural.

First dorsal originating well behind the pectorals and ventrals; its spines are low, and its margin rounded. Second dorsal higher than the first, pointed posteriorly in the male, rounded in the female. Anal similar to the second dorsal. Pectoral rounded, not reaching the vertical of the vent. Ventral inserted just behind the pectoral, pointed, the penultimate ray longest, not reaching the vent. Caudal rounded.

*Colour-marking.*—General colour greenish brown in formaline, the scales of the back and sides with darker margins. A characteristic row of dark vertical bars at the base of each scale along the middle of the side, and a blackish axillary spot. Head dusky with microscopic dots. Dorsal and anal fins dusky in the male with white margins and a darker submarginal stripe; caudal dusky, ventrals and pectorals transparent. The fins of the female may be similar to those of the male or quite transparent.

Described from twelve specimens 29-56 mm. long, including six males and six females, which were captured together in the Cudgegong River at Ryleston by Mr. D. G. Stead, 18th December, 1911. They exhibit remarkable *Sexual Dimorphism* which is figured on Plate xxxvii. The adult male has the nape, occiput, and interorbital area greatly swollen, the upper profile of the head being so elevated that the eye is far removed from it; the posterior rays of the dorsal and anal fins are longer than those preceding them, and the caudal peduncle is shorter than in the female. The eye of the female is close to the profile of the head, the interorbital space being only slightly convex; the dorsal and anal fins are rounded, the third or fourth rays being longest, and the caudal peduncle is long and slender.

*Variation.*—Several series of specimens from various localities between Narrandera, on the Murrumbidgee River, New South Wales, and Eidsvold, on the Burnett River, Queensland, prove that this species varies considerably in the number of spines and rays in the dorsal and anal fins, and in its scale counts. But the fact that some examples from the two

extreme localities agree in these characters, while others differ, proves that these are merely individual variations, and not subspecific characters. This variation, as exemplified by thirty-three specimens is shown in the following table.

Locality.	No. of specimens.	Dorsal.	Anal.	Scales longt.	Scales trans.
Ryleston, N.S.W.	1	8/12(13)	14(15)	33	11
Eidsvold, Qld.	1	8/12(13)	13(14)	35	11
”	1	8/12(13)	12(13)	35	11
Ryleston, N.S.W.	1	8/12(13)	11(12)	—	—
Eidsvold, Qld.	1	8/11(12)	13(14)	35	11
Ryleston, N.S.W.	1	7/13(14)	13(14)	33	11
” ”	1	7/13(14)	12(13)	32	11
” ”	1	7/12(13)	13(14)	32	11
” ”	1	7/12	13(14)	33	11
” ”	2	7/12(13)	12(13)	33	—
” ”	1	7/12	12(13)	32	11
” ”	1	7/13	13	—	—
” ”	1	7/13	14	—	—
” ”	1	7/11(12)	12(13)	—	—
Eidsvold, Qld.	1	7/12	12	30	9
” ”	1	7/12(13)	—	—	—
” ”	1	6/12(13)	11	30	9
” ”	1	6/12	12	30	9
” ”	1	6/11(12)	11(12)	32	10
” ”	1	6/11(12)	11(12)	29	9
” ”	1	6/11(12)	12(13)	—	—
” ”	1	6/11	11(12)	29	9
” ”	5	6/11	11	30	9
” ”	1	6/11	11	30	10
” ”	1	6/11	11	31	10
” ”	1	6/11	11	29	9
” ”	1	6/11	11	28	9
” ”	1	5/11	11	30	9

The scales on the nape are very large and regular in most of the Queensland specimens, while they are usually small and irregular in those from southern localities; but we have examples in which they are of intermediate size from both the northern and southern parts of their range, and a few from Eidsvold in which they are quite as small as those from Narrandera.

*Nomenclature.*—If it be considered that the name *C. klunzingeri*, Ogilby, 1898, is preoccupied by *Eleotris klunzingerii*, Pfeffer, 1893, it will be necessary to propose a new name for this species. Since the two do not enter the same genus, however, there appears to be no necessity for this course.

*Locs.*—North Yanko, near Narrandera, Murrumbidgee River, New South Wales; coll. David G. Stead, Jan. 1910. Ryleston, Cudgegong River, New South Wales; coll. David G. Stead, Dec. 1911. Pallal, Horton River, New South Wales; coll. A. R. McCulloch. Eidsvold, Burnett River, Queensland; coll. Dr. Thomas R. Bancroft.





EXPLANATION OF PLATE XXXI.

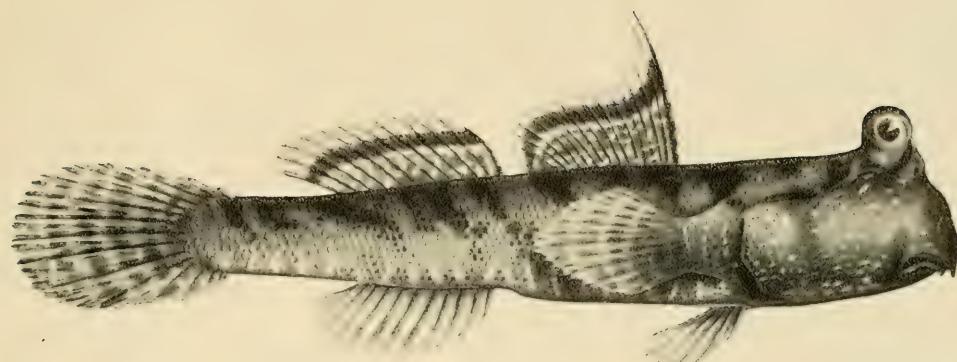
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Fig. 1. *Periophthalmus koelreuteri*, Pallas, var. *argentilineatus*, Cuvier and Valenciennes. A specimen 90 mm. long, from Sunday Island, King Sound, North-western Australia.

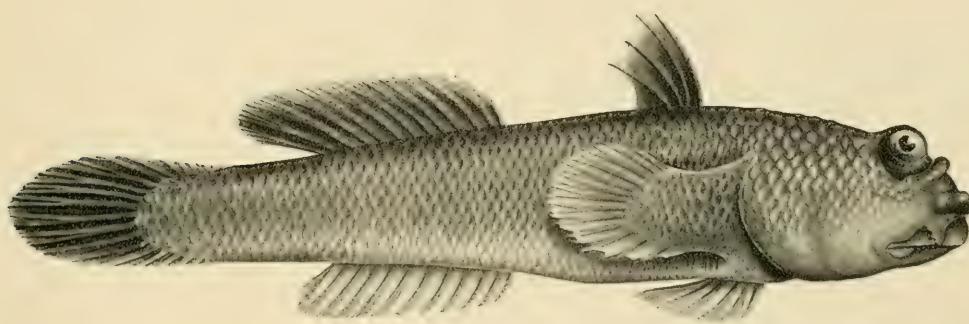
.. 2. *Periophthalmus barbarus*, Linné. A specimen 197 mm. long, from Cooktown, Queensland.

.. 3. *Leme purpurascens*, De Vis. Anterior portion of a specimen 92 mm. long, from an unknown locality.

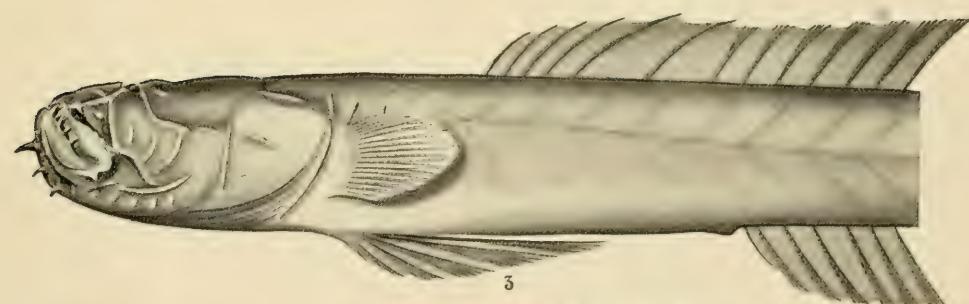
.. 4. *Leme mordax*, De Vis. Outline of a specimen 218 mm. long, from Ripple Creek, Herbert River, Queensland.



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4





EXPLANATION OF PLATE XXXII.

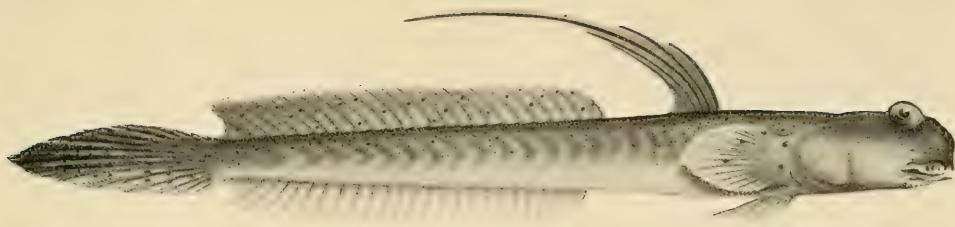
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Fig. 1. *Scartelaos viridis*, Buchanan. A specimen 136 mm. long, from the Burnett River Heads, Queensland.

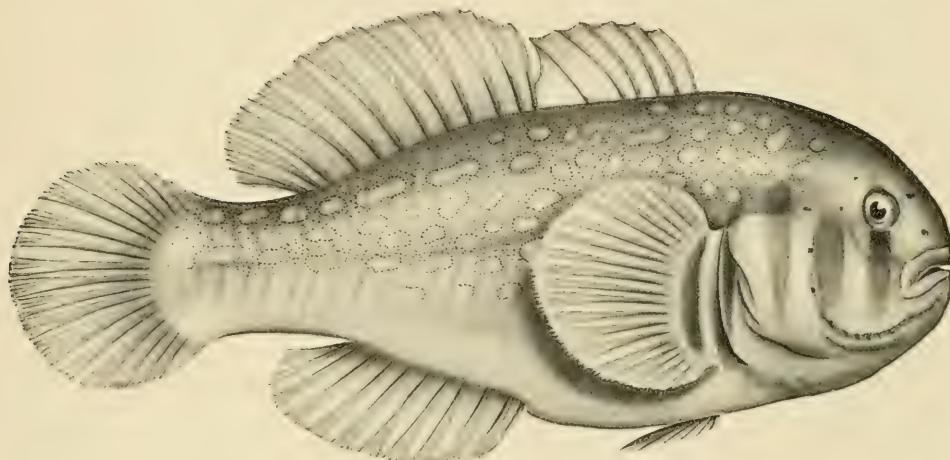
.. 2. *Gobiodon verticalis*, Alleyne and Macleay. A specimen 47 mm. long, from Green Island, near Cairns, Queensland.

.. 3. *Callogobius sclateri*, Steindachner. A specimen 47 mm. long, from Two Isles, North Queensland.

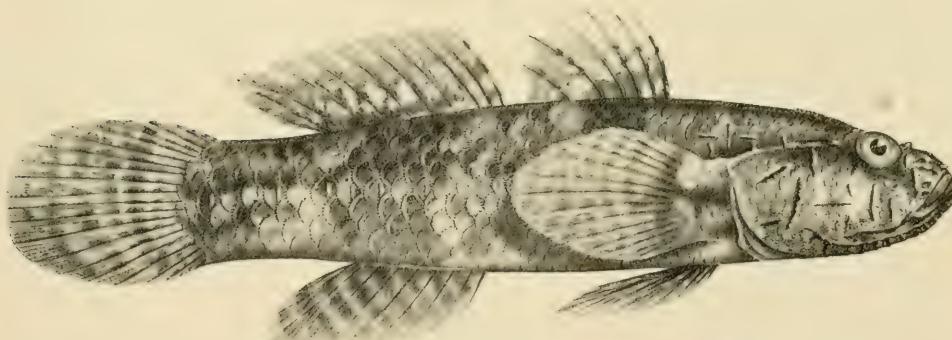
.. 4. *Callogobius hasseltii*, Bleeker, var. *mucosus*, Günther. A specimen 85 mm. long, from Port Jackson.



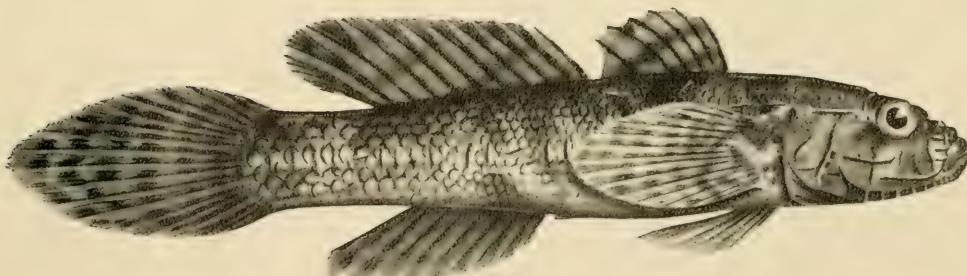
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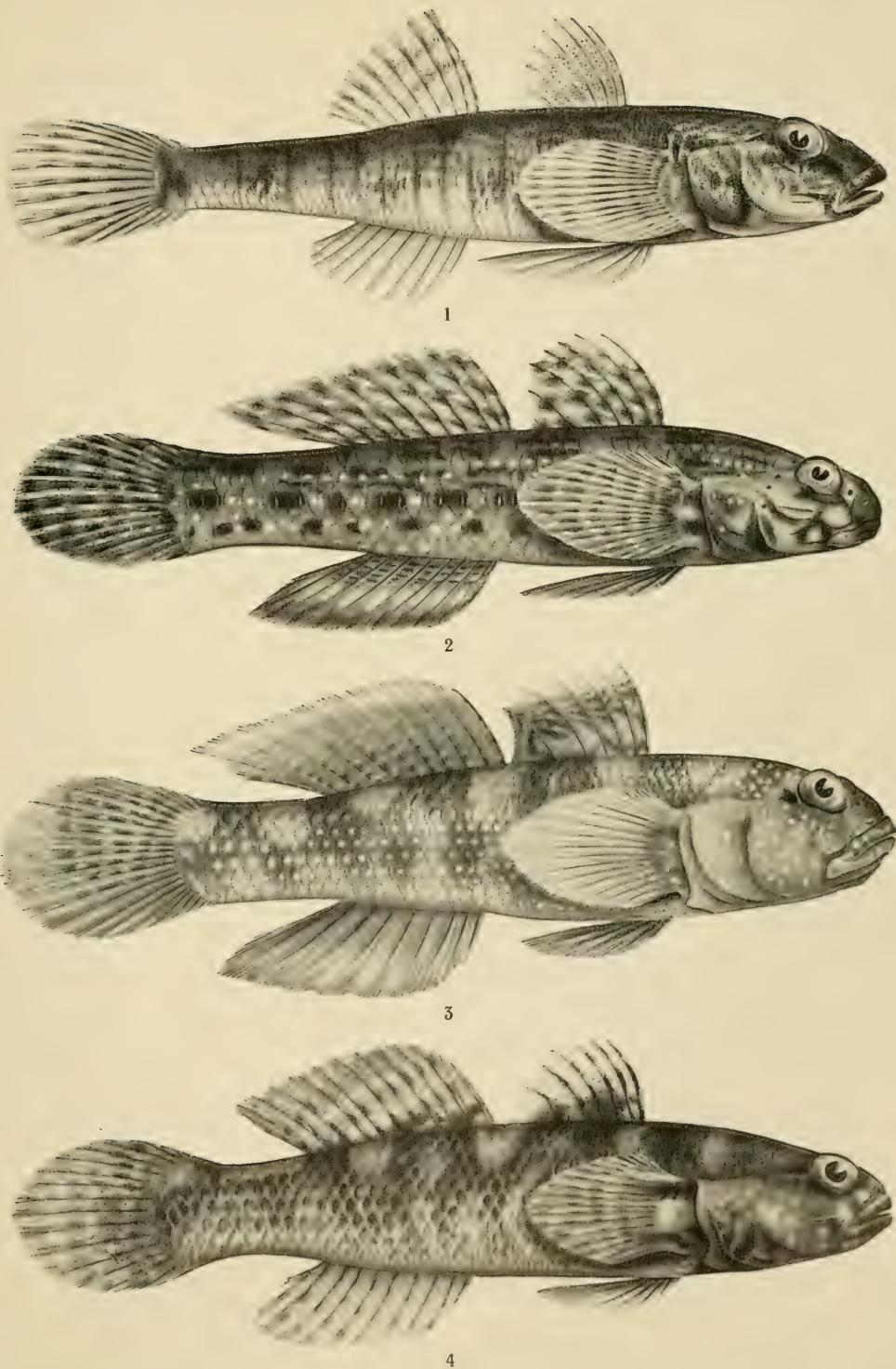




EXPLANATION OF PLATE XXXIII.

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- Fig. 1. *(Gobius) hinsbyi*, Johnston. A specimen 86 mm. long, from Wedge Bay, Hobart, Tasmania.
- .. 2. *Gobius ornatus*, Rüppell. A specimen 84 mm. long, from Murray Island, Torres Strait.
- .. 3. *Mapo fuscus*, Rüppell. A specimen 86 mm. long, from Darnley Island, Torres Strait.
- .. 4. *Mapo krefftii*, Steindachner. A specimen 61 mm. long, from Port Jackson.







EXPLANATION OF PLATE XXXIV.

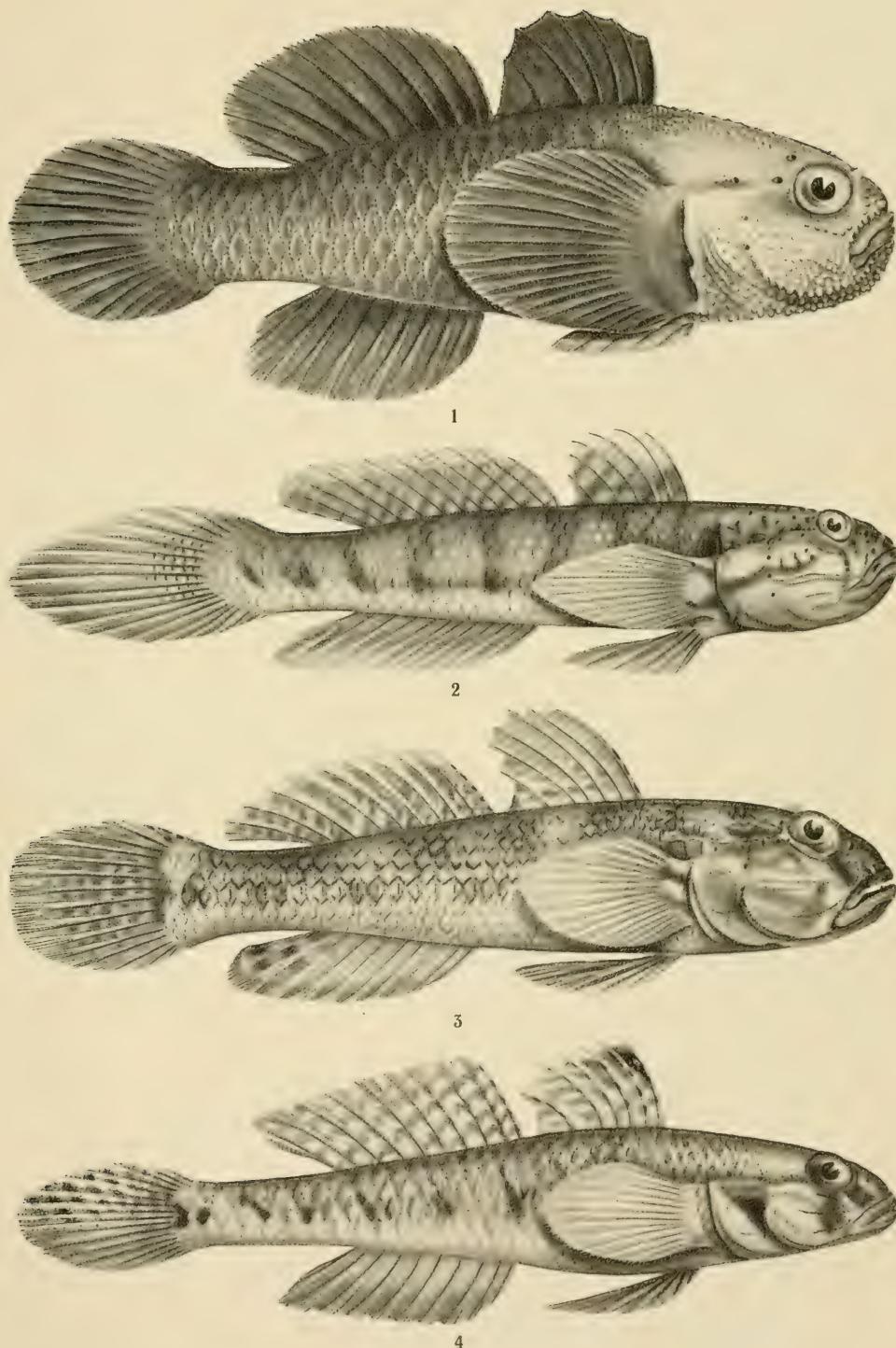
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Fig. 1. *Paragobiodon echinocephalus*, Rüppell. A young specimen  $23\frac{1}{2}$  mm. long, from Masthead Island, Queensland.

„ 2. *(Gobius) semifrenatus*, Macleay. A specimen 113 mm. long, from Botany Bay, New South Wales.

„ 3. *Rhinogobius leftwichii*, Ogilby. A specimen 66 mm. long, from the Great Sandy Strait, Queensland.

„ 4. *(Gobius) lateralis*, Macleay, var. *obliquus*, var. nov. Holotype of the variety, 56 mm. long, from Rose Bay, Port Jackson.







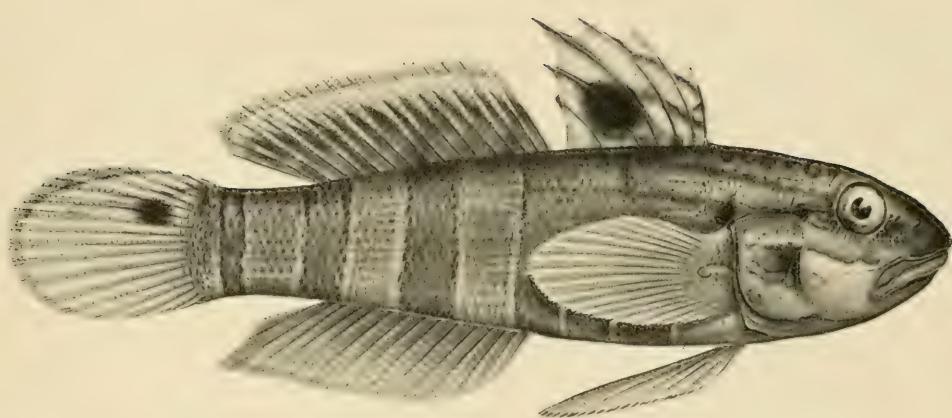
EXPLANATION OF PLATE XXXV.

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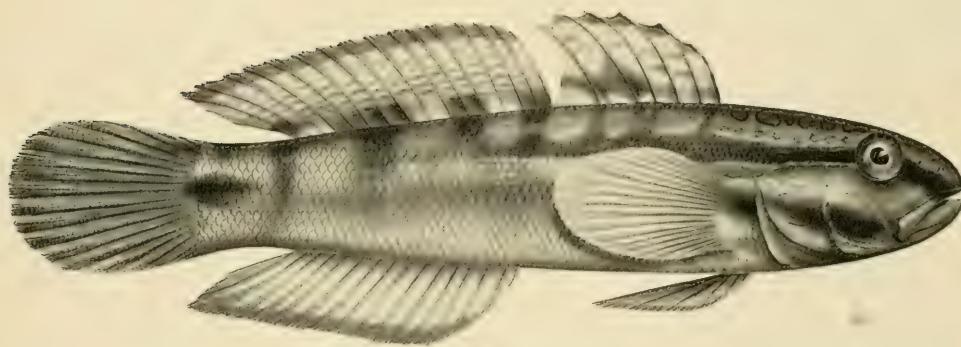
Fig. 1. *Amblygobius phalaena*, Cuvier and Valenciennes. A specimen 77 mm. long, from Murray Island, Torres Strait.

,, 2. *Amblygobius bynoensis*, Richardson. A specimen 92 mm. long, from Queensland.

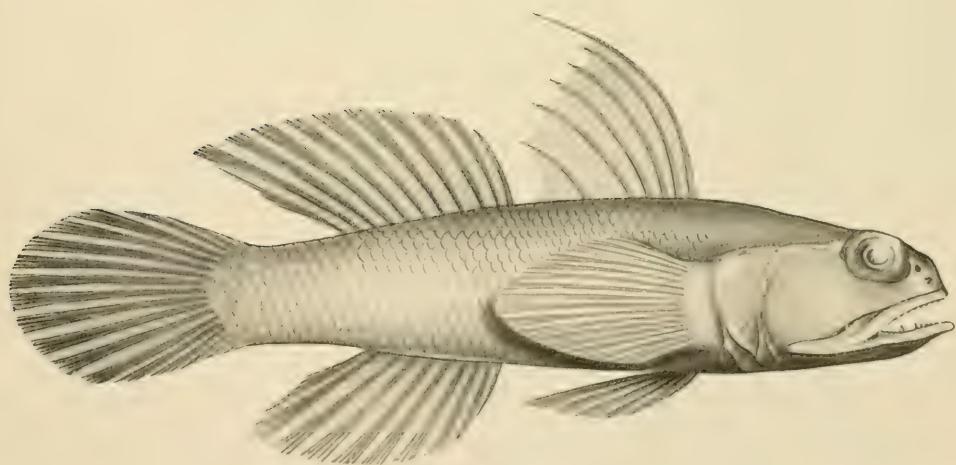
,, 3. *Waitea maxillaris*, Macleay. Holotype, 65 mm. long, from Port Darwin.



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EXPLANATION OF PLATE XXXVI.

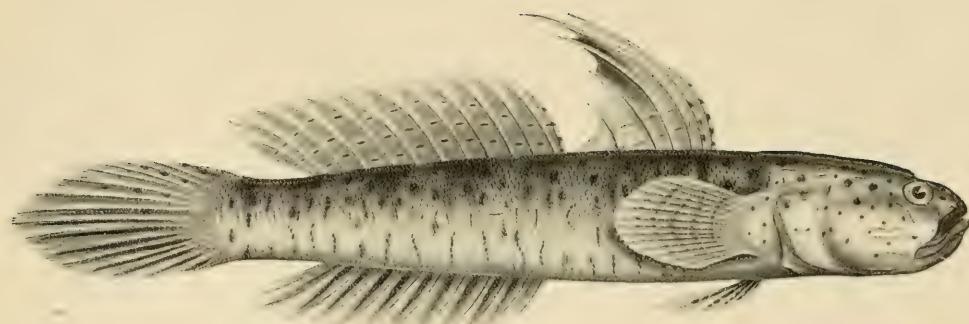
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Fig. 1. *Cryptocentrus gobiooides*, Ogilby. Cotype of *Gobius cristatus*, Macleay, 90 mm. long, from Port Jackson.

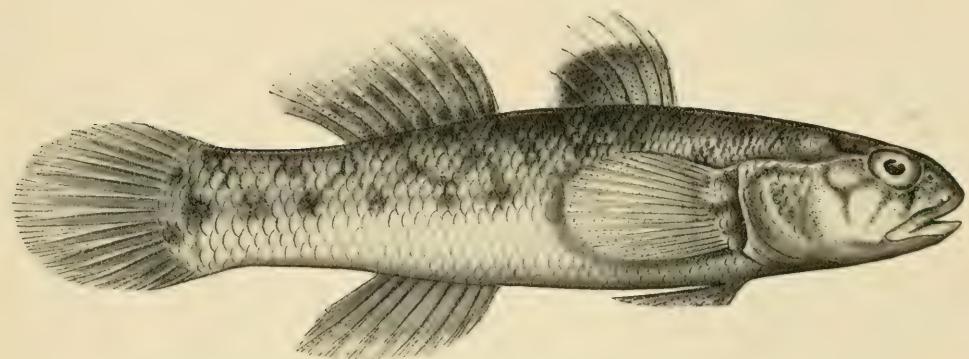
.. 2. *Mugilogobius devisi*, nom. nov. Cotype of *Gobius stigmaticus*, De Vis, 45 mm. long, from Moreton Bay, Queensland.

.. 3. (*Gobius*) *flavescens*, De Vis. A cotype, 32 mm. long, from Moreton Bay, Queensland.

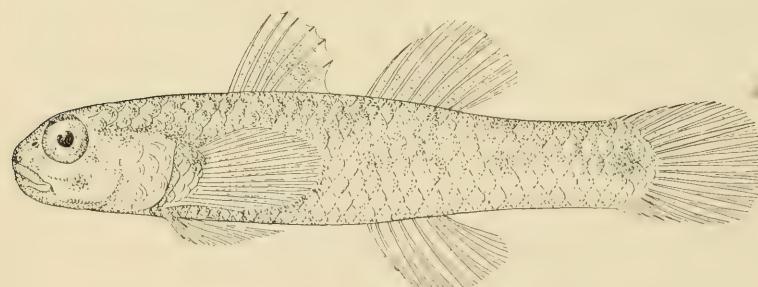
.. 4. *Butis amboinensis*, Bleeker. A specimen 133 mm. long, from the Brisbane River, Queensland.



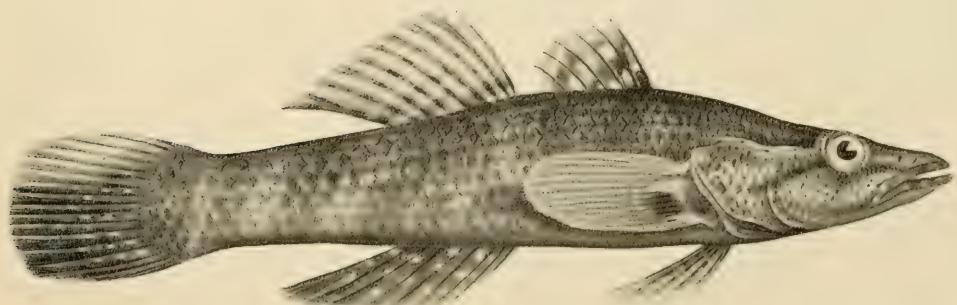
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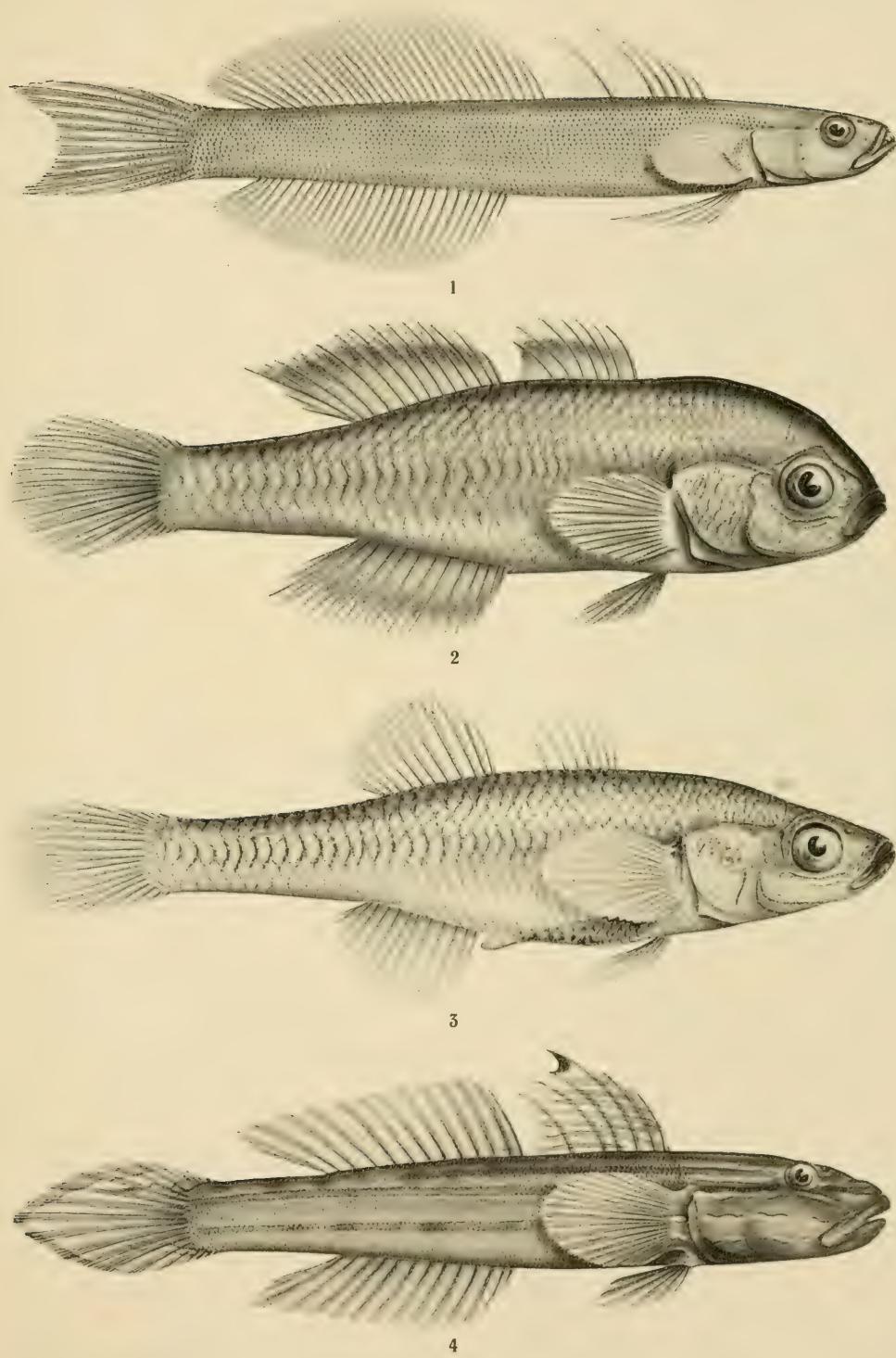




EXPLANATION OF PLATE XXXVII.

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Fig. 1. *Ptereleotris microlepis*, Bleeker. Holotype of *Eleotris elongata*, Macleay, 93 mm. long, from Darnley Island, Torres Strait.  
.. 2. *Carassius (Austrogobio) kyunzingeri*, Ogilby. Adult male, 57 mm. long, from the Cudgegong River, New South Wales.  
.. 3. *Carassius (Austrogobio) kyunzingeri*, Ogilby. Adult female, 42 mm. long, from the Cudgegong River, New South Wales.  
.. 4. *Valenciennea muralis*, Cuvier and Valenciennes. A specimen 109 mm. long, from Dunk Island, Queensland.





LISTS OF HIEROGLYPHICAL SIGNS AND WORDS IN THE  
FUNERARY INSCRIPTION OF NETER-NEKHT

BY

A. ROWE

(Author of "Guide to Egyptian Antiquities in the  
South Australian Museum").

In Plate xxvii. of the present volume I gave a complete copy of the Egyptian text on the coffin of Neter-Nekht in the Australian Museum, and I now present full lists of the hieroglyphical signs and words in this ancient inscription.

With the aid of these lists and also the English rendering of the text printed in my former article<sup>1</sup> it should be quite a simple matter for those interested to follow out for themselves the Egyptian words.

For sake of clearness, the pictorial words and signs in the plates are all placed in the same direction, and the numbers of the lines refer to the numbers in my previously published plate.

The following transliteration of the Egyptian inscription on the coffin should also be found useful to the beginner:—

TRANSLITERATION OF INSCRIPTION OF NETER-NEKHT.

Line (1) AMAKHI KHER AST, MAA-KHERU. (2) AMAKHI KHER SERQET, NETER-NEKHT. (3) AMAKHI KHER PAUT NETERU NETCHEST, NETER-NEKHT. (4) AMAKHI KHER NEBT-HET, ..... (5) AMAKHI KHER PAUT NETERU AAT, NETER-NEKHT, MAA [KHERU]. (6) AMAKHI KHER NET, NETER-NEKHT. (7) NESUT HETEP DA ANPU NEB SEPA, KHENTI NETER-HET; DA-F TCHA-K PET, SMA-K AR EN NETER AA, NEB PET, NETER-NEKHT, ARI EN .....TI. (8) NESUT HETEP DA ANPU, DEP-DU-F, AM UT, NEB TA-TCHESER, QEREST NEFERT EM SEMT-AMENTET; KHEP-F EM HETEP, SEP-SEN, EM AS-F ENT NETER-KHER, NETER[-NEKHT]. (9) AMAKHI KHER HAPI, NETER..... (10) AMAKHI KHER GEB, NETER-NEKHT. (11) AMAKHI ER (doubtless KHER) NUT, NETER-NEKHT. (12) AMAKHI KHER QEBHSENNUF, NETER-NEKHT. (13) NESUT HETEP DA ASAR NEB DEDDU, NETER AA, NEB ABDU; DA-F PER-KHERU TA, HEQT, AH, APD, MENKH, NETER-SENTHER, MERHET, KHET NEBT NEFERT EN MER AHET, NETER-NEKHT. (14) AMAKHI KHER AMSETHA NETER-NEKHT. (15) AMAKHI KHER SHU, NETER..... (16) AMAKHI KHER TEFNET, NETER-NEKHT. (17) AMAKHI KHER DUAMUTEF, NETER.....

<sup>1</sup> Rowe—"An Ancient Egyptian Coffin in the Australian Museum" (*Records Australian Museum*, xii., 8, 1919, p. 179.)

## COFFIN OF NETER-NEKHT.

Complete list of hieroglyphical signs.

Sign	Value	Picture of	Meaning (if an ideograph)	Line No.
	<i>a (aleph)</i>	eagle	—	7, 13
	<i>a (short)</i>	leaf	—	1-6, 8-12, 14-17
	<i>ab</i>	chisel (?)	—	13
	<i>ah</i>	ox's head	ox	13
	<i>amakh</i>	?	devotee	1-6, 9-12, 14-17
	<i>amentet</i>	feather on standard	west	8
	<i>am</i>	?	he who is in	8
	<i>Anpu</i>	jackal on tomb	Anubis (god)	7, 8
	<i>apd</i>	goose's head	goose	13
	<i>ar</i>	eye	to do, to make, to beget	7, 13
	<i>as</i>	seat	seat	1, 13
	<i>as</i>	?	tomb-chamber	8
	<i>a (ayin)</i>	arm and hand	—	7 (in "ar")
	<i>aa</i>	bolt	great	5, 7, 13
	<i>ar</i>	staircase	staircase	7
	<i>b</i>	foot	—	10, 13
	<i>du</i>	hill	hill	8, 13
	<i>da</i>	hand with cake	to give	13
	<i>da</i>	arm and hand	to give	7
	<i>da</i>	cake	to give	7, 8, 13
	<i>ded</i>	tree trunk	part of name of town (Deddu)	13
	<i>dep</i>	man's head	he who is on	8
	<i>dnu</i>	star	part of name of god (Duna-mutef)	17
	<i>f</i>	cerastes	he, him, it	7, 8, 12, 13, 16, 17
	<i>g</i>	throne	—	10
	<i>geb</i>	duck	Geb (god)	10
	<i>h</i>	coil of rope	—	9, 13
	<i>hap</i>	rudder	part of name of god (Hapi)	9
	<i>hetep</i>	altar	offering, peace	7, 8, 13

Sign	Value	Picture of	Meaning (if an ideograph)	Line No.
	heqt	jug of ale	ale, beer	13
	het	shrine, or house	house, shrine	7
	i	two leaves	—	1-7, 9-12, 14-17
	k	bowl	thee, thy	7
	kh	sieve	—	1-17
	khenti	3 vases in stand	governor, dweller in	7
	kheru	mace (?)	word, voice	1, 13
	m	owl	—	8
	m	?	—	14
	ma, or mu (?)	hand with cake	part of name of god (Dua- mutef)	17
	maa	reed	truth, right	1, 5
	menkh	loom	linen clothes	13
	mer	tongue	overseer	13
	mer	hoe	part of word for "oil"; also to "love"	13
	merhet	vessel of oil	oil	13
	n	wavy line of water	of, in, to, etc.	2, 6-8, 10-13, 16
	neb	bowl	lord	7, 8, 13
	Nebt-het	bowl on house	Nephthys(goddess)	4
	nefer	heart & lungs or musical instrument	beautiful, happy	8, 13
	nesut	reed	royal, king	7, 8, 13
	Net	shuttle	Neith (goddess)	6
	neter	axe	god, divine	2, 3, 5-17
	[ne]kht	branch of tree	strength	2, 3, 5-7, 10, 11, 13, 14, 16
	neter-kher	axe on throne	cemetery	8
	netches	sparrow	small	3
	nu	pot	—	11
	Nut	3 pots; sign for heaven; female determinative "t"	Nut (goddess)	11

Sign	Value	Picture of	Meaning (if an ideograph)	Line No.
■	<i>p</i>	square	—	7, 9
○	<i>paut</i>	round cake	company	3, 5
□	<i>per</i>	house, enclosure	to come forth	13
¶	<i>per-khernu</i>	house & mace	a coming forth at the voice	13
■	<i>pet</i>	sky	heaven	7
■	<i>pa</i>	goose flying	—	7
▲	<i>q</i>	knee	—	8
■	<i>qebh</i>	vase	part of name of god (Qebh-sennuf)	12
■	<i>qerest</i>	sarcophagus on sledge	burial ; sarcophagus	8
○	<i>r</i>	month	—	1-17
ſ	<i>s</i>	back of chair	—	7, 14
ſ	<i>s</i>	back of chair (written wrong way round on coffin)	—	8
■	<i>serget</i>	scorpion	a goddess	2
—	<i>s</i>	bolt	—	7, 8
●	<i>sep</i>	circle	a time, a season	8
—	<i>sen</i>	two strokes	twice	8
↓	<i>sen</i>	arrow (?)	part of name of god (Qebhsennuf), and of "incense."	12, 13
■	<i>sent</i>	hills or mountains	country	8
▼	<i>smtu</i>	union of reproductive organs	to unite	7
■	<i>seput</i>	centipede (?)	part of name of town (Sepa)	7
—	<i>sh</i>	tank (?)	—	15
■	<i>shu</i>	ostrich feather	Shu (god)	15
●	<i>t</i>	cake	—	1-3, 5-8, 10-11, 13, 16, 17
●	<i>ta</i>	cake	cake offering	13
—	<i>ta</i>	land	land	8
■	<i>th</i>	tongs	—	13
—	<i>th</i>	?	—	14

Sign	Value	Picture of	Meaning (if an ideograph)	Line No.
	<i>tcheser</i>	hand with mace	holy, sacred	8
	<i>tcha</i>	fire-stick (?)	—	7
	<i>u</i>	chicken of the quail	—	8, 13, 15
	<i>ut</i>	mummy bandages	embalmment	8
	<i>utchut</i>	sacred eye of god Horus	protection (on eastern side of coffin)	

## WORD DETERMINATIVES (not pronounced).

Sign	Value	Picture and Determinative of	Remarks	Line No.
	town		has the value of “ <i>nut</i> ,” but when written after names of towns is not pronounced	7, 13
	hills or mountains		usual value of “ <i>sem</i> ,” etc.; when used as a determinative, not pronounced	8
	building		not to be confused with “ <i>per</i> ”—to come forth	8
	land		—	13
	land		—	8
	three strokes		sign of plural	13
	three dots		also sign of plural	12
	pair of legs		indicates action with legs, such as walking, running, etc.	8
	roll of papyrus tied up standard		sign of the abstract names of gods and goddesses sometimes written on standards	13 2, 6
	sky		although in most cases used as word for “heaven” it is also used as an unpronounced determinative, e.g., the word “ <i>Nut</i> ” (the sky-goddess)	11
	boat		indicates a journey by water	7

## COFFIN OF NETER-NEKHT.

Complete vocabulary of hieroglyphical words.

			Line No.
	<i>aht</i>	<i>A</i> (aleph) farm-lands	13
		<i>A</i> (short)	
	<i>Abdu</i>	Abydos (town)	13
	<i>ah</i>	oxen	13
	<i>Amsetha</i>	Amsetha (god)	14
	<i>am</i>	dweller in	8
	<i>amakhi</i>	devotee	1-6, 9-12, 14-17
	<i>amentet</i>	western hills	8
	<i>Anpu</i>	Anubis (god)	7, 8
	<i>apd</i>	geese	13
	<i>ari</i>	begotten of	7
	<i>Ast</i>	Isis	1
	<i>as</i>	tomb-chamber	8
	<i>Asar</i>	Osiris	13
		<i>A</i> (ayin)	
	<i>au</i>	great	7, 13
	<i>aat</i>		5
	<i>ar</i>	staircase	7
		<i>D</i>	
	<i>da</i>	to give	13
	<i>da</i>	to give	7
	<i>da</i>	to give	7, 8, 13
	<i>Deddu</i>	Busiris	13
	<i>Duamutef</i>	Duamutef (god)	17
	<i>dn</i>	hill	8
	<i>dep</i>	he who is on	8
	<i>dep du-f'</i>	he who is on his hill	8
		<i>F</i>	
	<i>f'</i>	he, him, it, his	7, 8, 13

			Line No.
	<i>Geb</i>	Geb (god)	10
		<i>H</i>	
	<i>Hapi</i>	Hapi (god)	9
	<i>heqt</i>	ale	13
	<i>hetep</i>	offering	7, 8, 13
	<i>hetep</i>	peace	8
	<i>hetep sep sen</i>	“peace, times twice” = in peace, in peace	8
		<i>K</i>	
	<i>k</i>	thee, thy	7
		<i>KH</i>	
	<i>khenti</i>	governor of, dweller in	7
	<i>khep</i>	to journey	8
	<i>kher</i>	before	1-6, 9, 10, 12, 14-17
	<i>kheru</i>	word	1, 13
	<i>(mua-kheru)</i>	right of word	1
	<i>khet</i>	things	13
	<i>khet nebt</i>	“things all” = everything	13
		<i>M</i>	
	<i>em</i>	in	8
	<i>maa</i>	right	1, 5
	<i>maa-kheru</i>	right of word	1
	<i>menkh</i>	linen garments	13
	<i>mer</i>	overseer	13
	<i>mer ahet</i>	overseer of farm lands	13
	<i>merhet</i>	oil	13

	N		Line No.
	<i>n</i>	of, in	7, 8
	<i>neb</i>	lord	7, 8, 13
	<i>nebt</i>	all (also, lady)	13
	<i>Nebhet</i>	Nephthys	4
	<i>nefert</i>	beautiful	8
	<i>nefert</i>	beautiful	13
	<i>nesut</i>	royal, king	7, 8, 13
	<i>nesut</i>	royal, king	7, 8, 13
	<i>hetep</i>	may the king give an offering	7, 8, 13
	<i>da</i>	offering	7, 8, 13
	<i>Net</i>	Neith (goddess)	6
	<i>Neter-Nekht</i>		6
	<i>Neter-Nekht</i>	name of the deceased	5
	<i>Neter-Nekht</i>		16
	<i>neter</i>	god, divine	7, 8, 13
	<i>neteru</i>	gods	3, 5
	<i>neter-het</i>	divine house	7
	<i>neter-kher</i>	cemetery	8
	<i>neter-senther</i>	incense	13
	<i>netchest</i>	little	3
	<i>Nut</i>	sky-goddess	11
	<i>P</i>		
	<i>pant</i>	company	3, 5
	<i>per-khern</i>	a coming forth at the voice	13
	<i>per-khern ta heqt</i>	cake and ale offerings which come forth at the voice	13
	<i>pet</i>	heaven	7
	<i>Q</i>		
	<i>Qebhseunuf</i>	a god	12
	<i>qerest</i>	burial; coffin	8

	<i>R</i>		Line No.
	<i>er</i> (or, <i>r</i> ) (an ab- before breviation for <i>kher</i> ).		11
	<i>S</i>		
	<i>sem</i>	<i>sem-t-amentet</i>	mountains of the west
			8
	<i>sma</i>		to unite
"	<i>sen</i>		twice
•	<i>sep</i>		a time
•	<i>sep-sen</i>		times twice
	<i>Sepa</i>		a town
	<i>Serqet</i>		a goddess
		<i>SH</i>	
	<i>Shu</i>		a god
		<i>T</i>	
	<i>ta</i>		cake
	<i>ta</i>		land
	<i>Ta-Tcheser</i>		“Holy Land”
	<i>Tefnet</i>		a goddess
	<i>...ti</i>		latter portion of name of deceased's parent (per- haps KHATI)

*TCH* (or, *DJ*)

	<i>tcha</i>		to traverse, to sail	7
	<i>tcheser</i>		see “Ta-Tcheser.” The latter word means “holy.”	8
	<i>U</i>			
	<i>ut</i>		mummy chamber	8













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